The Cotton Gin and Oil Mill

PRESS

MARCH 14, 1953

54th year

THE MAGAZINE OF THE COTTON GINNING AND OILSEED PROCESSING INDUSTRIES

A PROGRESSIVE AND RESPONSIBLE PUBLICATION

Recommended sprays or dusts, when properly applied by ground machines or from the air, pay off in higher yields, better grades, lower cost

●

Sixth Annual

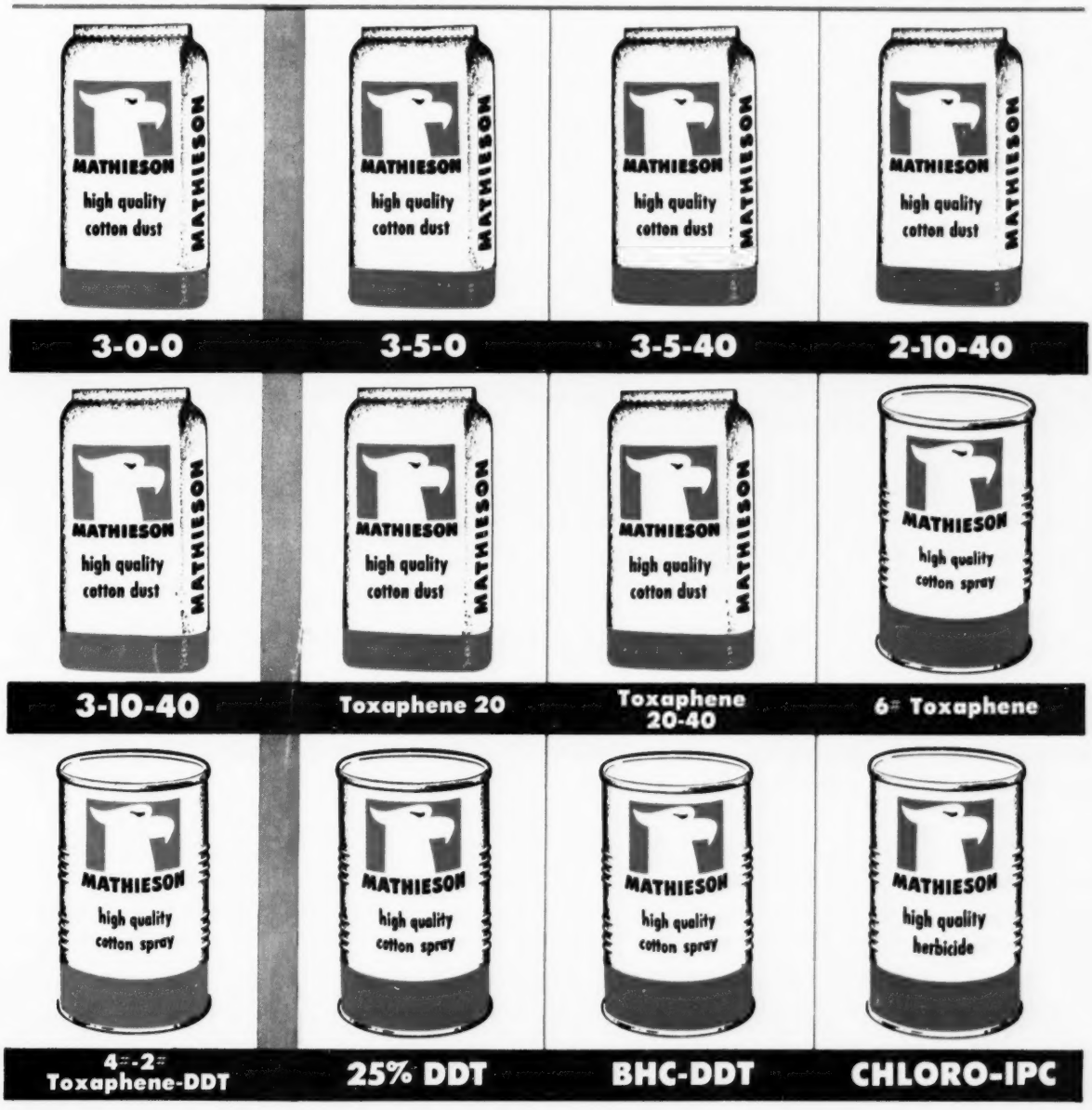
COTTON INSECT CONTROL ISSUE

●

Keep and use this issue as your guide to more effective control of insects in 1953

Entered as second-class matter February 4, 1905, at the Post Office at Dallas, Texas, Under Act of Congress of March 3, 1897

cotton insect control? check Mathieson first



For early season, mid season, and late season cotton insect control . . . check your Mathieson dealer first for high quality cotton sprays and dusts. For best results, follow a consistent schedule as recommended by your state authorities.

MATHIESON

MATHIESON AGRICULTURAL CHEMICALS COMPANY

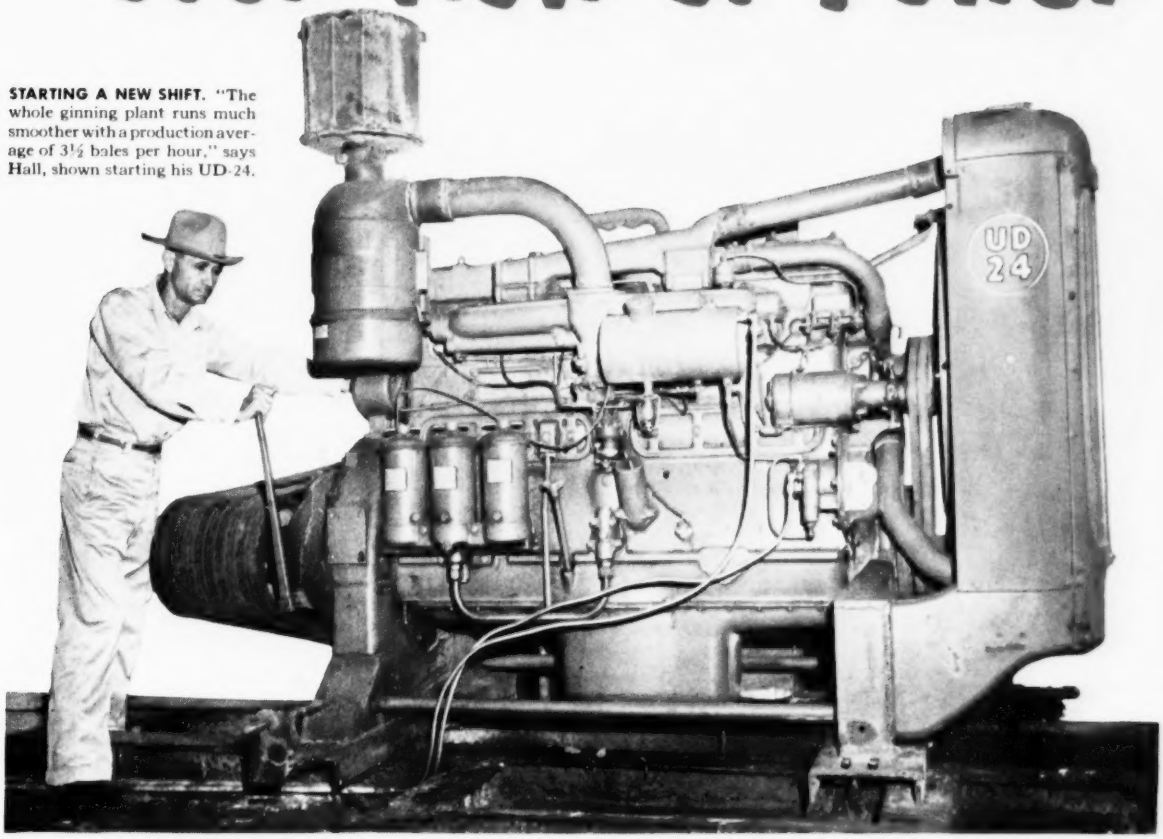
Division of Mathieson Chemical Corporation

LITTLE ROCK, ARKANSAS

SALES OFFICES: Baltimore 3, Maryland; Houston 2, Texas; Jackson, Mississippi; Lebanon, Pa. Little Rock, Arkansas; Phoenix, Arizona; St. Louis 2, Missouri; Williamston, No. Carolina.

1572

"I like that even flow of Power"



STARTING A NEW SHIFT. "The whole ginning plant runs much smoother with a production average of 3½ bales per hour," says Hall, shown starting his UD-24.

Texas ginner finds International UD-24 steady and reliable

Down in Don Tol, Texas, the L. B. Hall Gin installed a new International UD-24 and got a big production pick-up in their 4-stand, 70-saw gin operation.

In a ninety-day period toward the close of last season, this gin ran 1,233 bales, with much smoother production throughout.

"Since we got the UD-24 we have all the power we need. I particularly like the smooth, even flow of power," says ginner Hall. "We have used Internationals around this gin for over 10 years and find they're built for hard work."

How about you? Get the facts and figures on International power from your International Industrial Distributor or Power Unit Dealer. Do it now!

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

INTERNATIONAL INTERNATIONAL HARVESTER **POWER THAT PAYS**

Laugh IT OFF

Little boy watching milkman's horse: "Mister, I'll bet you ain't gonna get home with your wagon."

Milkman: "Why?"

Little Boy: "'Cause your horse just lost all his gasoline."

• • •

Shun the man
Who doesn't read;
In him ignorance
Planted her seed;
Rich man, poor man,
Beggar man, thief;
The son-of-a-gun is on
Mental relief.

• • •

The girl who is a vision in the moonlight may be a sight in the sunlight.

• • •

An astronomer points out that the planet Venus cannot support life. We might add that it is also becoming a bit difficult on this planet.

• • •

Personnel manager interviewing applicant for job—

"How long did you work in the other place?"

"Fifty-five years."

"How old are you?"

"Forty-five years."

"How could you work 55 years when you are only 45 years old?"

"Over-time."

• • •

Money talks,
Has much to say,
Yet never gives
Itself away.

• • •

In a final effort to discipline her bad and wayward chick, the mother hen said to him: "If your father could see you now, he'd turn over in his gravy."

• • •

"What do you mean, I have baby hands?"

"They're just beginning to creep."

• • •

Viva: "Let's give the bride a shower."

Joe: "I'll bring the soap."

• • •

Every man likes to see a broad smile . . . especially if she smiles at him.

• • •

He: "May I kiss you?"

She: "Heavens! Another amateur!"

• • •

Some college girls pursue learning. Others just learn pursuing.

• • •

Beautiful new neighbor: "Little boy, I need a loaf of bread from the store. Do you think you could go for me?"

Little boy: "No, but I heard my old man say he sure could!"

• • •

The auto engine pounded and suddenly wheezed to a stop on the lonely road.

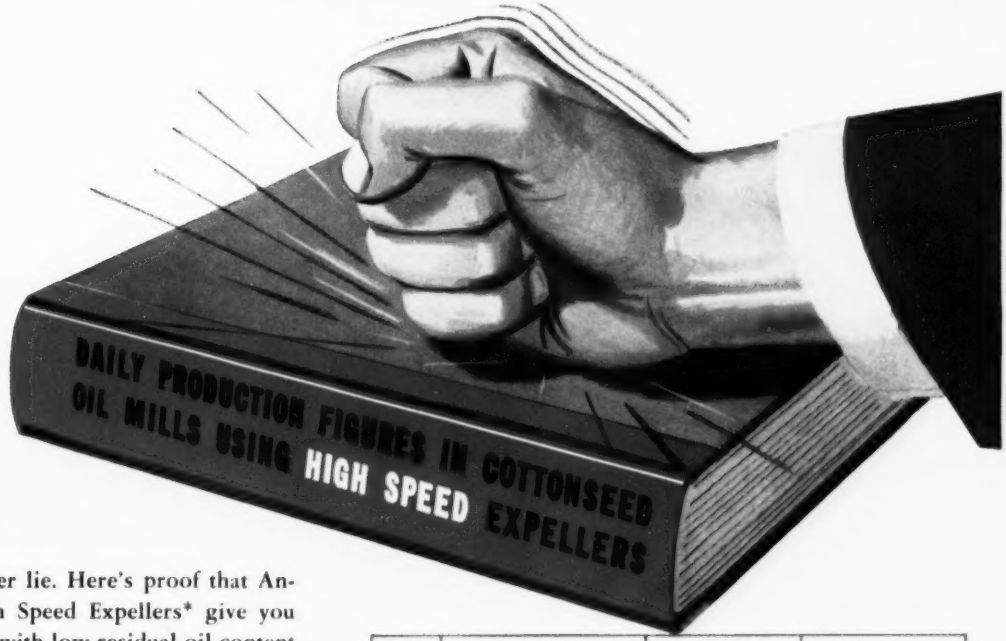
"I wonder," mused the young man, "what that knock was?"

"Maybe," suggested his blonde companion, "it was opportunity."

• • •

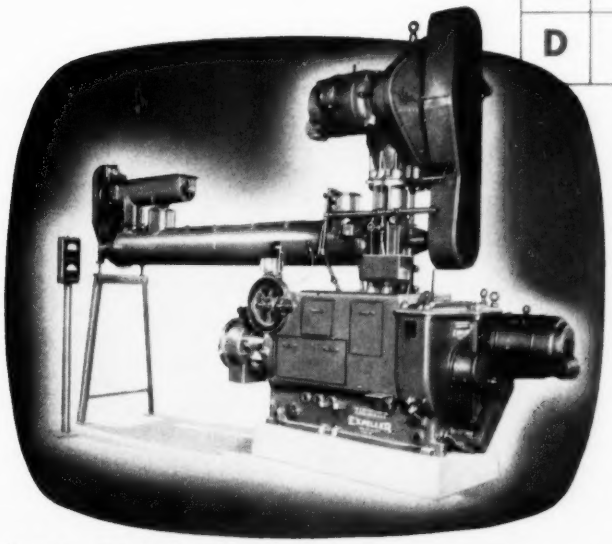
"I wish we'd get some shipwrecked sailors washed ashore," mused the cannibal chief. "What I need is a good dose of salts."

FACTS NOT FICTION!



● Figures never lie. Here's proof that Anderson's High Speed Expellers* give you high capacity with low residual oil content on cottonseed. These facts, taken from 4 of the 24 oil mills now operating with Anderson's High Speed Expellers, give actual operating data. We know you'll agree the results are truly remarkable for continuous screw press operation.

OIL MILL	EXPELLER CAPACITY Tons per Hour	RESIDUAL OIL	LENGTH OF TEST
A	49.8	3.90%	1 week
B	45.3	4.09%	3 weeks
C	45.1	3.86%	2 weeks
D	51.2	4.0%	4 weeks



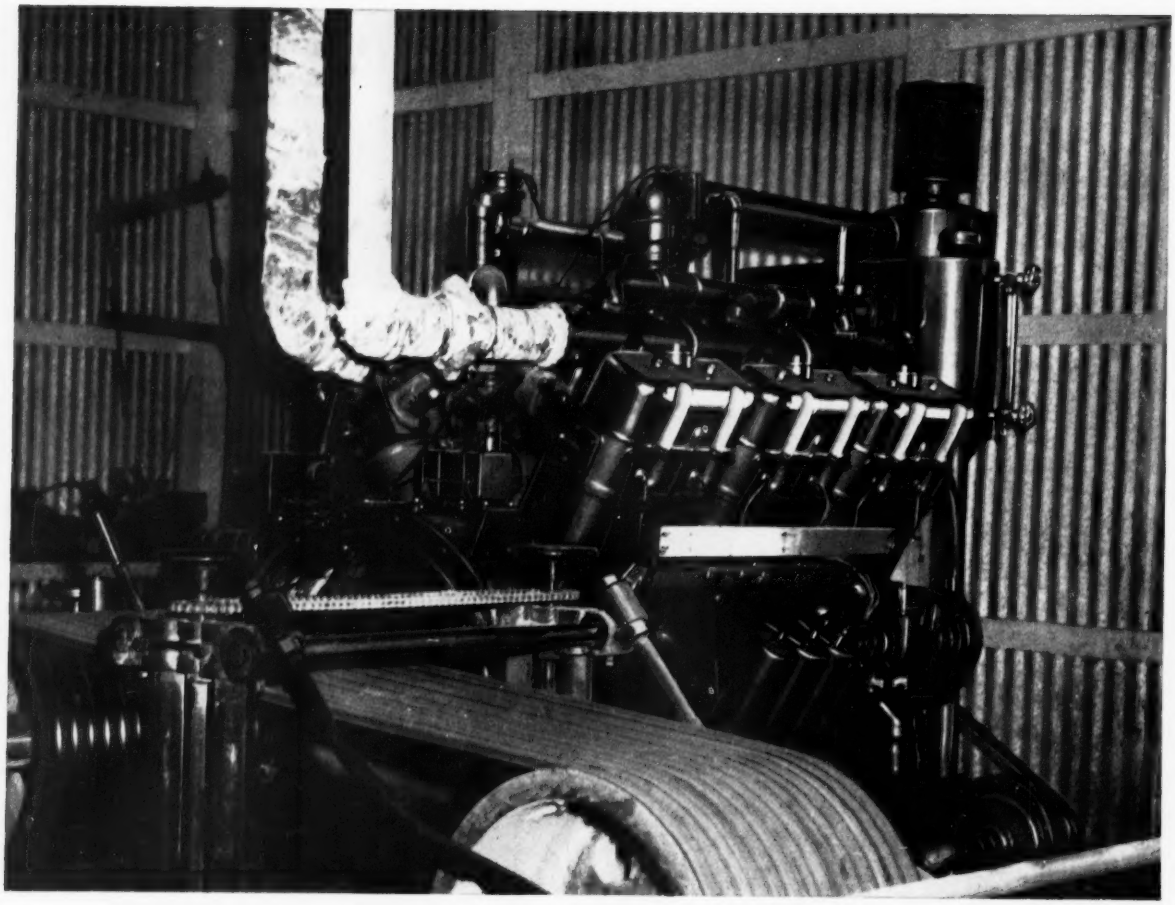
In all probability there's one of these mills near you. We would like to show you through one of these plants. See for yourself how High Speed Expellers obtain this exceptional production.

To visit a High Speed Expeller cottonseed oil mill write or phone and we will be glad to make arrangements for you.

THE V. D. ANDERSON COMPANY
1941 West 96th Street • Cleveland 2, Ohio
OLympic 1-1900

*T. M. Reg. in U. S. Pat. Office

ONLY ANDERSON MAKES EXPELLERS!



"40,000 bales ginned at only 16c per-bale power cost —using **Le Roi** *engines!"*

COTTON INDUSTRY POWER
LE ROI

PROMPT SERVICE • LOW FUEL COST • LESS DOWNTIME • CONSERVATIVE RATING

At Taylor, Texas, you're really trimming ginning power costs, when you get them down to 16 cents per bale! And that's the average figure reported by F. W. Urbish of Urbish Gin Co. It includes the cost of natural gas, oil, and engine repairs.

Mr. Urbish says, "Le Roi is my idea of a perfect gin engine." He ought to know engines — he's had twenty-two years of ginning experience. He got his first Le Roi in 1937 and has three now.

Like Mr. Urbish, more ginners insist on Le Roi engines than on any other engine. A Le Roi is specially designed for the specific power requirements of cotton gins. It has the weight and stamina to operate dependably without costly breakdowns. Yet, it takes less floor space than other engines of similar horsepower rating.

Sizes range from 40 to 450 continuous hp. You can use low-cost natural gas, butane, or propane.

Service and parts at any hour are as close as your phone—through Le Roi's network of well-stocked, adequately manned distributors.

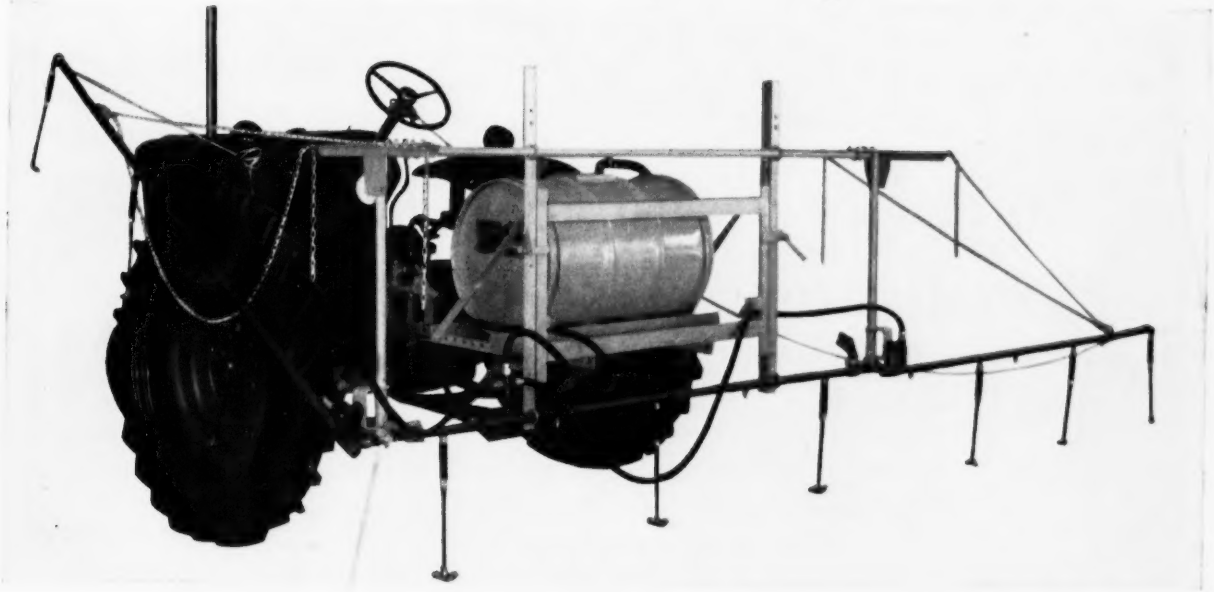
Have a Le Roi distributor show you a Le Roi installation — and see for yourself why Le Roi reduces your power cost per bale.

F-41

Le Roi Cotton-Engine Distributors: Carson Machine & Supply Co., Oklahoma City, Okla. • General Machine & Supply Co., Odessa, Texas • Southern Engine & Pump Company, Houston, San Antonio, Kilgore, Dallas, Edinburg, Corpus Christi, Texas, and Lafayette, Houma, La. • Ingersoll Corporation, Shreveport, La., Jackson, Miss. • Tri-State Equipment Co., Little Rock, Ark., Memphis, Tenn. • Nortex Engine & Equipment Co., Wichita Falls, Texas • Farmers Supply, Lubbock, Texas.

LE ROI COMPANY • *Plants:* **Milwaukee-Cleveland-Greenwich, Ohio** • *Cotton-Industry Headquarters:* **Tulsa, Okla.**

Make sure your Cotton Crop *Pays Off*



Growers report better all-around protection with

IRON AGE COTTON SPRAYERS

Rugged, dependable Iron Age Cotton Sprayers assure you complete protection, maximum coverage, and lower spraying costs, year after year. That's why growers everywhere say, "Spray the Iron Age Way!"

Check these features of the Iron Age Cotton Sprayer: Bronze gear pump, driven from power take-off. Pressure regulating valve for maximum protection. 50-gallon tank with mounting parts for quick, easy assembly!

Booms are rear mounted, with your choice of 6 to 8 row coverage, with nozzle arrangements for 3 to 5 nozzles per row. 36″, 38″, 40″, or 42″ row spacing. Universal spacing—34″ to 42″—can be quickly secured by adding hose and clamp assemblies.

The Iron Age Cotton Sprayer mounts on all popular row crop tractors, with special kits available for Ford, Ford-Ferguson, and Ferguson tractors. When ordering, specify tractor make and model.

Whatever your acreage, it will pay you to investigate Iron Age Cotton Sprayers. Learn how they can give you better protection at less cost!

OLIVER

IRON AGE

Finest in Farm Machinery

THE OLIVER CORPORATION, Dept. 3003,
400 W. Madison Street, Chicago 6, Ill.

Please send me information on IRON AGE COTTON SPRAYERS.

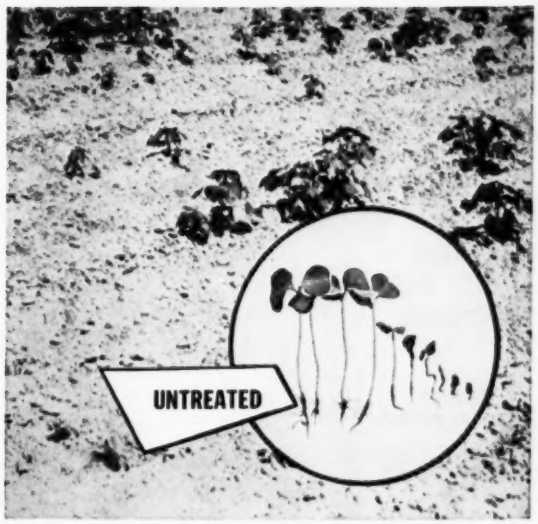
Name .....

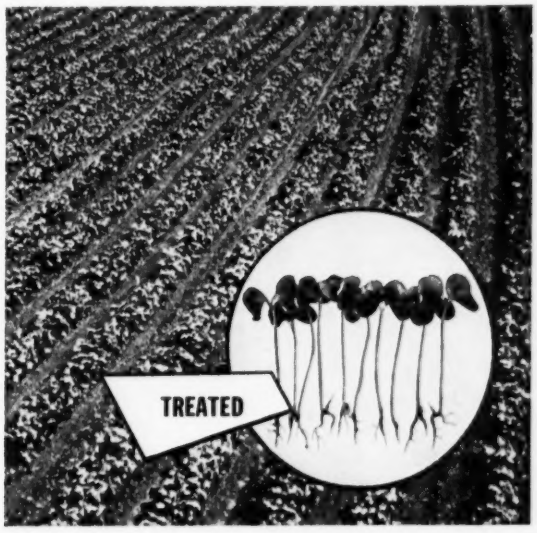
Address .....

City ..... RFD ..... State .....

I raise ..... acres of cotton.

Effective Seed Treatment Benefits YOU and YOUR CUSTOMER





BE SURE ALL SEED IS TREATED PROPERLY WITH CERESAN®

Even with the best cotton seed, even with the newest varieties, many cotton growers have suffered poor germination, poor stands, disappointing yields. These troubles result from seed rot, damping off, angular leaf spot and anthracnose.

Proper treatment pays two ways. Trouble can start if seed isn't treated, or if treating is not done carefully. When good seed is properly treated with "Ceresan" seed disinfectant, growers get good disease control and good stands.

Growers get better yields . . . up to 40% better, even in unfavorable seasons, as long as seed is properly treated with "Ceresan."

Your benefits come at ginning time when the larger crop from treated seed comes in, and in repeat business from satisfied customers. It pays to make sure your operators apply the right amount of "Ceresan."

***For full details** on effective seed treating, write to Du Pont, Semesan Section, Wilmington, Delaware.*

USE TREATED GRAIN AND GRASS SEED, TOO

"Ceresan" seed treatment for grain controls seed rot, seedling blights, many kinds of smut on wheat, oats, barley and rye. Helps produce better stands and better yields of clean grain

"Arasan" seed treatment for grass and legumes controls seed rot and seedling blight, helps these tiny seeds to get a strong start. Improves stands and vigor resulting in better yields and pasture crops.

RECOMMENDED TREATMENTS

MECHANICALLY DELINTED COTTONSEED		
2% "Ceresan"	Dry	6 oz./100 lbs.
"Ceresan" M	Dry or Slurry	3 oz./100 lbs.
ACID-DELINTED COTTONSEED		
2% "Ceresan"	Dry	4 oz./100 lbs.
"Ceresan" M	Dry or Slurry	2 oz./100 lbs.
FUZZY COTTONSEED		
2% "Ceresan"	Dry	9 oz./100 lbs.
"Ceresan" M	Dry or Slurry	4½ oz./100 lbs.

DU PONT CERESAN®
REG. U.S. PAT. OFF.
Seed Disinfectant and Protectant

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

THE COTTON GIN AND OIL MILL

PRESS

54th year

THE MAGAZINE OF THE COTTON GINNING AND OILSEED PROCESSING INDUSTRIES

Volume 54 **March 14, 1953** **Number 6**

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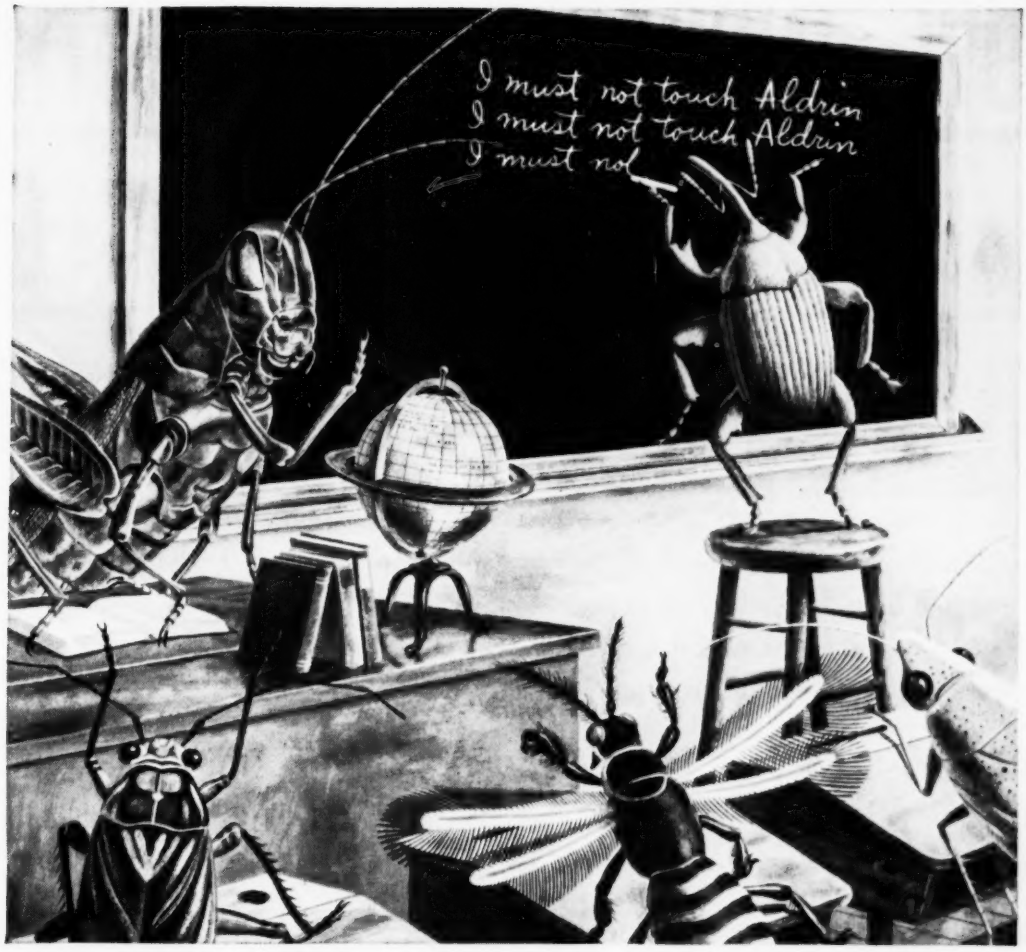
Executive and Editorial Offices: 3116 Commerce St., Dallas 1, Texas

The Cover

THE ISSUE is special, the cover is special, and the need to control cotton insects is, as always, a SPECIAL need in cotton production. We don't exactly place insect control ahead of other good production practices in importance, but when pests are abundant, it usually pays off better per dollar invested than anything the grower can do to obtain high yields efficiently produced.



A thousand times, No!

BE IT BOLL WEEVIL OR FLEAHOPPER, thrips, rapid or tarnished plant bug, the cotton pest that touches aldrin will do well to write its will. This insecticide is effective in unbelievably small doses.

For instance, just one ounce of aldrin controls thrips on an acre of cotton! And a pound will massacre boll weevils on four acres of cotton.

Aldrin has a partner—dieldrin—equally lethal and economical. Dieldrin is recommended for all those applications requiring residual action. It goes on killing . . . longer.

Because aldrin and dieldrin compounds are sprayed or dusted from the ground or from planes, effective coverage is quick and easy. No wonder cotton growers are insisting on the insecticide that "kills the mostest with the leastest!"

Aldrin and dieldrin are tested, proved and officially approved for cotton insect control. You can get aldrin and dieldrin from your own dealer.

Julius Hyman & Company Division

SHELL CHEMICAL CORPORATION

P. O. Box 2171, Denver 1, Colorado

NEW YORK • ATLANTA • CHICAGO • HOUSTON • ST. LOUIS • SAN FRANCISCO • LOS ANGELES

NOW—INSURE AGAINST BOTH SOIL INSECTS • SEED DISEASES WITH ONE PRODUCT

In one easy operation you can now increase your crop yields by protecting against wireworms, seed corn maggots, seed rot and damping-off diseases. ORTHO Seed Guard assures you top germination—good paying stand.

ORTHO Seed Guard is an insecticide-fungicide combination containing ISOTOX (Lindane) and ORTHOCIDE (Captan) for protection of corn, grain, cotton, vegetable, legume, soy-bean and many other seeds before planting.

More Effective 2-Way Protection

Field tests have proved that a combination insecticide-fungicide gives seed protection that is more dependable and more effective than *either* material used alone.

More yields per acre

ORTHO®

World leader in scientific pest control

ORTHO Seed Guard provides a smooth chemical coating that sticks to the seed—does not harm seed or soil but serves as protection against soil insects and seed and seedling diseases.

Economical

Only 1½ oz. per bushel of seed required for treatment. Saves planting extra seed; saves late and expensive replanting.

Easy To Use

Merely add directed amount to water and mix with seed in barrel, tub or any convenient container.

Safe and Compatible

ORTHO Seed Guard has proved to be non-injurious to seeds or seedlings on a great variety of crops. Chemically compatible with many other insecticides and fungicides.

For more information on how ORTHO can boost your crop profits call your ORTHO fieldman or dealer or write:

CALIFORNIA SPRAY-CHEMICAL Corp.

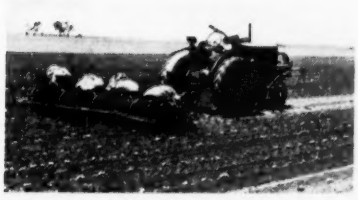
Shreveport, Louisiana
Orlando, Florida
Fresno, California
Oklahoma City, Oklahoma
Goldsboro, North Carolina
Phoenix, Arizona

Other offices throughout the U.S.A.

T.M.'S REG. U. S. PAT. OFF.: ORTHO, ORTHOCIDE, IS

Laying off cotton rows uniformly is important in many ways. It makes cultivation more efficient later on. Straight rows, evenly spaced, mean that your spraying or dusting machine can apply your toxaphene right where it belongs when the plants come up. High acre yields begin here.

WHAT YOU DO NOW HELPS DECIDE HOW MUCH COTTON YOU'LL PICK LATER



Good cultivation helps speed the growth of cotton in its early stages. This is the time to be looking for thrips, fleahoppers, cutworms, and other insects that are controlled by toxaphene dusts or sprays.

Mr. W. D. Walker, cotton farmer of Satin, Texas is a pioneer user of toxaphene against thrip damage early in the season. The plant on the left was untreated. The healthy plant on the right was sprayed with toxaphene.

Now is the time to prepare for big cotton yields. Lay off straight, evenly spaced rows for easier, better, and more economical field work. Insect control starts now, too. This is the time to make sure you have enough toxaphene insecticides on hand, so that you can use them when the first cotton insect pests attack your stand.

Toxaphene dusts and sprays kill all common cotton insects. Toxaphene is easy and economical to apply. Talk to your insecticide supplier about toxaphene or write Hercules.

Naval Stores Department
HERCULES POWDER COMPANY
943 King Street, Wilmington 99, Del.
Plants at Brunswick, Ga., Hattiesburg, Miss. Offices at Atlanta, Birmingham, Brownsville, Dallas, Los Angeles, Raleigh

Whether you use mechanical harvesters or not, good cultivation and the proper use of toxaphene insecticides throughout the growing season have helped promote high acre yields for many thousands of cotton farmers.

TOXAPHENE dusts · sprays

N453-1

THE CHEMICAL BASE FOR TOXAPHENE IS PRODUCED BY HERCULES FROM THE SOUTHERN PINE

Keep Fields Bug-Free in '53

Cotton insects can be Profitably CONTROLLED

"With the increased investment required for mechanized cotton production, growers can not afford to ignore cotton insect control. Unless they carefully plan and conduct their insect control program each year as they do fertilization, seed-bed preparation, cultivation and harvesting, they can not obtain consistently profitable results."

H. G. JOHNSTON is Head, Research Development, Division of Production and Marketing, National Cotton Council of America, Memphis.

By H. G. JOHNSTON

THERE IS NO DOUBT that greater progress has been made in the economical control of cotton insect pests during the last five years than during any similar period in previous years. This has been due largely to the extensive development of new chemicals for insect control and improved methods of application in the development of low volume, low pressure sprayers.

The development of new organic chemicals has made possible insecticide combinations that are effective for the control of all major cotton pests throughout the season. The use of spray formulations of such insecticides combined with the rapid development of low pressure, low volume sprayers has made it possible to follow a more rigid schedule of applications which is essential for effective control. Experiment station research and "farmer experience" across the Cotton Belt have shown conclusively that increased yields of one-half to one bale of cotton per acre often result from a properly conducted insect control program.

Despite the tremendous progress made in improved methods of control, losses to cotton insect pests are still high. In the "Boll Weevil Belt" cotton insects caused a reduction from full yield of 26.9 percent in 1950. In terms of percent reduction this was the second greatest loss on record, exceeded only in 1922 when the reduction from full yield amounted to 35.5 percent. The estimated dollar value of insect losses in 1950 was the highest on record, amounting to $907,884,000 for lint and seed. This was an extremely heavy loss as compared to the ten year average (1941-1950) of $347,266,000. Due to excessive dry weather in 1951 and 1952 the insect population was greatly reduced and the losses were less severe than in 1950. An analysis of conditions during 1950 affords an excellent opportunity to evaluate the cotton insect control program since the development of the new organic insecticides.

During this period the consumption of insecticides in the boll weevil states increased from approximately 22,700,000 pounds in 1946 to 464,150,000 pounds of field strength dust equivalent in 1950. Despite this tremendous increase, the amount of insectides used in 1950 was probably less than half the amount needed for adequate control if all of it had been properly used. The total amount used was sufficient for only 26.8 pounds of field strength insectides per acre of cotton harvested. With an average of 10 pounds per acre application only 2.68 applications could have been made for the entire acreage.

Cotton insect losses in 1950 were abnormally high in practically every section of the "Boll Weevil Belt." A large number of weevils went into hibernation in the fall of 1949 and survived a mild winter even in the extreme Northern part of the Cotton Belt. As a result the number of weevils emerging in the spring of 1950 was at a record high. Excessive rains during the growing season were favorable for the development of boll weevils and bollworms, seriously hindered the regular application of insecticides, and delayed maturity of the crop so that damage continued late in the season.

Results of experiments across the weevil belt indicated that a range of 6 to 12 applications of insecticides was required for adequate control when properly applied. It is evident then that the total amount of insecticides used in 1950, equivalent to 2.68 applications, was wholly inadequate for complete control. Probably no less than an average of 6 applications or a total of approximately 950,000,000 pounds of insecticides would have been needed for adequate control during 1950 in the "Boll Weevil Belt" alone.

Although the use of insecticides has increased rapidly since the introduction of organics it is obvious from the following table that the amounts used have not been sufficient to adequately control

Year	Acreage Boll Weevil Belt	Percentage Reduction From Full Yield	Field Strength Insecticides Used	Average Pounds per acre
1947	19,867,000	9.2	47,500,000	2.9
1948	20,899,000	6.6	85,650,000	4.1
1949	24,580,000	19.2	185,000,000	7.5
1950	17,325,000	26.9	464,150,000	26.8
1951	24,500,000	9.4	750,000,000	30.6

such infestations as developed in 1949 and 1950.

Many cotton growers across the Cotton Belt have done an excellent job of applying insecticides properly and at the right time. As a result they made more profit from the use of insecticides in 1950 than any other year in the history of cotton insect control. Such evidence from "farmer experience" and from experimental fields showed conclusively that cotton insect pests can be successfully and profitably controlled even under such adverse conditions as existed in 1950. However, a relatively large number of applications was required for adequate control under such conditions.

One large scale field test in the Brazos River Valley in Texas is an excellent example of this situation and many others could be cited from other sections of the Cotton Belt. A 42 acre field was planted to cotton following alfalfa. Due to adverse weather conditions the cotton was planted in late May and came up to a stand the first week in June. In general such fields of late cotton in this area are considered practically hopeless with such insect infestations as devoloped in 1950. Heavy infestations of both boll weevils and bollworms developed when the cotton was still small. Ten applications of insecticides were made by airplane on 40 acres and approximately two acres were left untreated as a check. The 40 acres treated averaged 1223 pounds of seed cotton per acre more than the untreated check, or an average of 122 pounds of seed cotton per acre for each application of insecticides. This treatment produced an average net profit of $133 per acre. Any farmer who has fertile soil capable of producing good yields of cotton can duplicate these results and many are doing so consistently.

The above example definitely disproves a very common fallacy still believed by many cotton growers—that insect control is not profitable when a large number of applications is required. Numerous experiments across the Cotton Belt over a period of many years have shown that the average net gain per acre over the check is in direct proportion to the number of applications required for complete control. On fertile soils, capable of producing one bale of cotton per acre, organic insecticides have averaged 90 to 100 pounds of seed cotton per application when properly used. On less productive soils net gains are proportionately less.

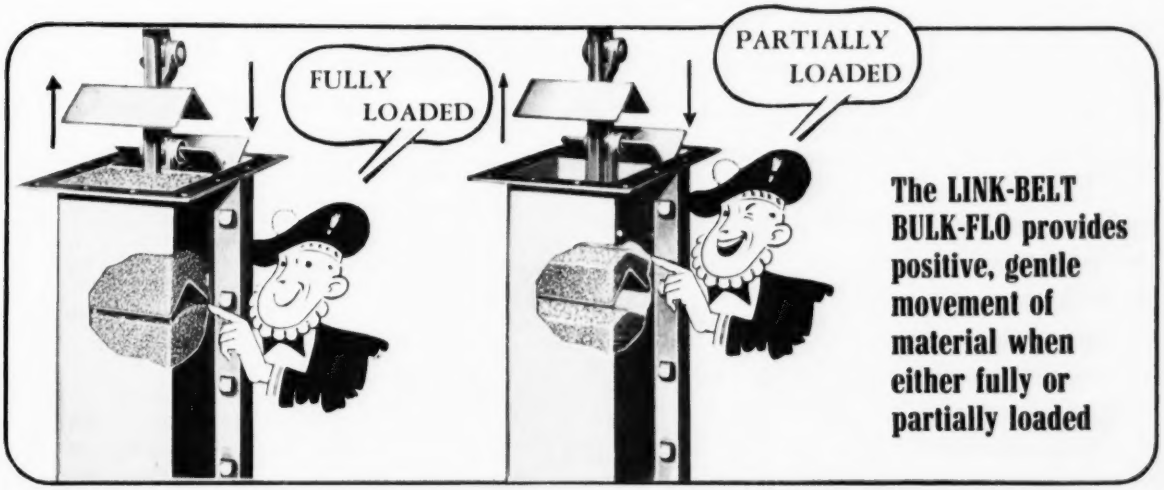
Perhaps the most significant factor which has prevented the development of a consistently adequate insect control program is the complacent attitude developed by too many farmers in years when insect damage is low. In 1948 when the reduction from full yield, 6.6 percent, was one of the lowest in 25 years, many farmers made good yields without using insecticides. In 1949 they hoped to do the same thing in spite of a greatly increased insect infestation. In many sections of the Cotton Belt damaging infestations of boll weevils and bollworms developed by mid-season and many growers were unprepared to cope with the situation. When it became evident that serious damage was being done, a desperate attempt was made by many to handle the situation but it was too late for maximum results. Consequently many growers suffered terrific losses. The same complacency has developed during 1951 and 1952 when insect populations have been comparatively low due to excessive dry weather.

The most important factors in cotton insect control are still the proper timing of applications and a sufficient number of applications to obtain complete control. Applications of insecticides made at 7 to 8 day intervals when 4 to 5 day intervals are recommended may be practically worthless and certainly will not produce satisfactory results. Failure or poor control results more frequently from *"Too Little and Too Late"* than from any other causes.

Insect control has become an important factor in cotton production and must be given proper consideration in the production schedule. Insect losses increase the cost of cotton production and every effort should be made to reduce this cost to a minimum. With the increased investment required for mechanized cotton production, growers can not afford to ignore cotton insect control. Neither can they afford to approach the problem in a half-hearted haphazard manner. Unless cotton growers carefully plan and conduct their insect control program each year as they do fertilization, seedbed preparation, cultivation and harvesting, they cannot expect to obtain consistently profitable results.

■ **THE NATIONAL Cottonseed Products Association, National Cotton Ginners' Association and all state ginners' associations have chosen The Cotton Gin and Oil Mill Press as their official magazine.**

Combined feeder · conveyor · elevator cuts your handling costs



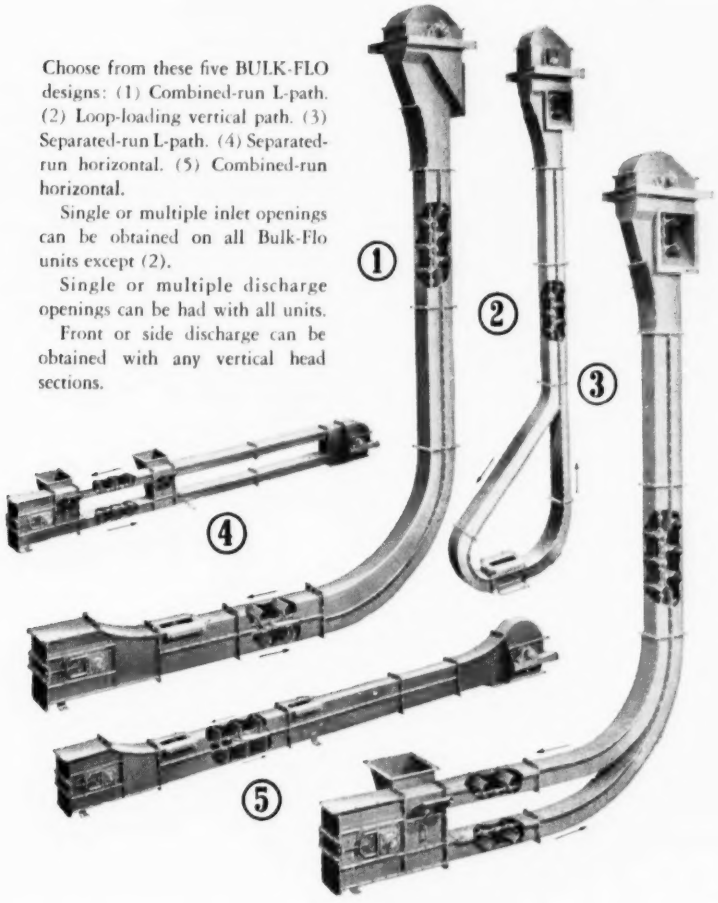
The LINK-BELT BULK-FLO provides positive, gentle movement of material when either fully or partially loaded

Choose from these five BULK-FLO designs: (1) Combined-run L-path. (2) Loop-loading vertical path. (3) Separated-run L-path. (4) Separated-run horizontal. (5) Combined-run horizontal.

Single or multiple inlet openings can be obtained on all Bulk-Flo units except (2).

Single or multiple discharge openings can be had with all units.

Front or side discharge can be obtained with any vertical head sections.



BULK-FLO gives you true versatility in bulk materials handling . . . at lower cost. It replaces several units in less space . . . cuts initial outlay. And because solid flights operate independently of internal pressure, BULK-FLO can be operated at less than full capacity, with positive movement of materials.

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Keep Fields Bug-Free in '53

1953 State Guides for Controlling Insects

Ginners, cottonseed crushers and others who work with the grower should urge him to follow his own state guide in carrying out his 1953 insect control program.

1953 Cotton Insect Control Recommendations for:

Alabama

The cotton insect situation is such that farmers in Alabama and the Southeast have little on which to base the hope that control measures will not be needed in 1953. It is the feeling of a majority of the growers in this state: "Well, the weevils did not cause much trouble in 1951, and still less in 1952. Surely we will get by again this year." This attitude could cost cotton farmers in this area millions of dollars.

The facts are, above the average number of boll weevils went into winter quarters in good condition. Trash collected last fall on the Experiment Station at Auburn showed as many as 43,000 weevils per acre. The average was about 12,000 per acre. The weather has been ideal so far this winter, for weevils in hibernation. It is a sure thing however, that the weather during the growing season has a lot more to do with weevil damage than any other factor. The past two summers have been very dry, and it is hard to imagine that rainfall will not be normal or above this summer.

Late last summer there was an unusual population of bollworms. There is every reason to believe that this pest of cotton will have to be considered.

Aphids and other insects that attack cotton likely will be present in the usual numbers. It appears, therefore, that farmers who plan their operations in advance should equip themselves with machines and poison and be ready to control these pests.

Insecticides, that are effective in the control of cotton pests, are cheaper now than they have been in the past. It seems like a good time for farmers to buy at least one-half of the amount of poison that will be needed to put on a good control program this summer. Several insectides or combinations of materials will effectively control boll weevils and other cotton insects under Alabama conditions. Dust formulations that contain aldrin, 2.5 percent; or dieldrin, 1.5 percent; or heptachlor, 2.5 percent, and 5 percent DDT, when used at the rate of 10 to 15 pounds per acre will control all of the major pests except aphids and spider mites. Dust that contains 3 percent gamma of BHC and 5 percent DDT; or calcium arsenate, when used in alternate applications with BHC-DDT; or 20 percent toxaphene, will effectively control all cotton pests except spider mites. Apply these materials at the rate of 10 to 15 pounds per acre, except calcium arsenate. It is used at the rate of 7 to 10 pounds per acre.

Spider mites have damaged cotton over wide areas in this state only one year in the past twenty-five years. Therefore, sulphur is not recommended in any of these formulations. In fields where spider mites do occur in damaging numbers, dust cotton with 3 percent aramite, 1 percent EPN or 1 percent parathion. Apply at the rate of 20 to 25 pounds per acre at four-day intervals until mites are controlled. Usually two applications will give good control of mites.

Thrips occasionally damage the stand of cotton in some fields. Any of the recommended dusts will control thrips except calcium arsenate. Apply dust at the rate of 5 to 7 pounds per acre. Repeat the treatment at five-day intervals until pests are controlled.

Aphids may occur in damaging numbers where fields have not been treated or have been improperly treated. For the control of aphids on cotton, apply the 3-5 mixture of BHC-DDT every five days, at the rate of 15 to 20 pounds per acre, until pest is controlled.

Bollworms often cause serious damage in fields of cotton that have been treated improperly with insecticides. Fields that are treated regularly at five day interval with recommended materials, ordinarily will not be damaged by worms. In fields where bollworms do build up, apply 10 percent DDT at the rate of 15 to 20 pounds per acre. Dust every 4 or 5 days until the worms are controlled.

All materials recommended in this paper are equally effective when used as a spray or dust except calcium arsenate, and those recommended for the control of spider mites.

The most important thing for farmers to remember is that you poison insects, not cotton. Therefore, do not treat until the plants are fruiting freely unless there is danger of the stand being damaged.

When plants are large enough to have ten or more squares, big enough for weevils to puncture, examine each field every week. Take one hundred or more good sized green squares at random by walking diagonally across the field. When from 15 to 25 percent of the squares are found to be punctured it is time to start control program. It is most important that cotton be treated every five days. Treating once a week will not do the job. Put on three applications, then wait a week or not more than ten days. Take square samples again from every field, and if the infestation is still up to around 25 percent, treat three times more at five day intervals. When cotton plants are blooming in the top and out on the end of the limbs, and migrating weevils are present in the blooms, poison every four days. It will require 3 to 4 applications of poison to protect top crop of bolls from insect damage.

1953 Cotton Insect Control Recommendations for:

Arizona

PRACTICE GOOD FARMING

Always prepare a good seed bed.
Follow good planting practices.
Use certified seed.
Treat all seed.
Follow a good fertilizer program.
Follow recommended irrigation practices.
Set up a plan for adequate insect control.

Control of cotton insects by new insecticides is very important, but it alone will not give high yields or good quality. Neither will just following good farming practices. It takes a combination of good seed, good farming practices, and insect control to get the desired results.

Learn to recognize the injurious cotton insects. Use a bug net (15-inch diameter) at several points in the field to determine if insects are present in harmful numbers. When you are sweeping for the injurious insects, you also may catch many beneficial insects.

Learn to know the beneficial insects. Most of them are predators. You may catch the big eye bug, the aphis lion, the **Orius**, nabids and assassin bugs that feed on **Lygus**, stink bugs and rapid plant bugs as well as eggs and small worms of the cotton bollworm and other worms.

You also may catch the ladybird beetle in both larval and adult stages that feeds on aphids and thrips. Nearly all of these insects feed on aphids. There are other beneficial insects that you may see in field demonstrations.

Start control applications when 6 to 8 injurious sucking insects are found in the bug net after making 100 sweepings over the tops of cotton plants. These

Quotes From Our Authors:

"TOTAL LOSS caused by the pink bollworm in the 38 counties (of southern Texas) was $28,195,000. It is felt that this is a conservative estimate, but at the same time it is an alarming amount of damage to be caused by an insect which until the last two seasons had never caused any appreciable loss in the area surveyed."—A. J. CHAPMAN and K. P. EWING.

counts should be made at several places in the field. One way, you may walk diagonally across the field. If cotton is rank, only 25 sweeps may be made at a point. Then base your count on 100 sweepings. When fleahoppers alone are present you should have 16 to 20 per 100 sweepings.

Start control of chewing insects, principally bollworms, when they start appearing in the growing tips of the cotton plant. The eggs are laid on the tender growing tips. From the egg a very small worm hatches. It eats its egg before feeding on the plant, then the squares and bolls.

Look for these worms on 25 or 50 plants in a row. If you should find 2 to 4 small worms in these counts at several points in the field, start dusting or spraying. You cannot control large worms.

Do not dust or spray as a preventative measure or just because your neighbor dusts or sprays. Endeavor to apply insecticides when weather conditions are favorable. Consider other crops and beneficial insects when controlling the injurious insects. Tall rank cotton may require heavier applications than are recommended here.

CONTROL THESE INSECTS

Below are the injurious cotton insects of Arizona and controls based on research conducted by Mr. W. A. Stevenson and other workers of the Bureau of Entomology and Plant Quarantine, Division of Cotton Insects.

CHEWING INSECTS

• **Beet Armyworm**—The beet armyworm may be the first insect to harm your cotton. It feeds on the cotton plant when it is in the seedling stage, and in some instances may partially destroy the crop. It is not injurious every year, as parasites usually keep it under control. Some seasons late infestations injure squares.

A dust mixture of 5 percent DDT and a high percentage of 325-mesh conditioned sulphur will give good control when applied at the rate of 15 pounds per acre. If a spray is used, be certain to apply ¾ of a pound of technical DDT per acre. One pound of toxaphene per acre in sulphur dust or spray is an alternate material to use.

• **Darkling Beetles and Cutworms** — These are minor pests. However, some seasons they may be very injurious, especially following alfalfa or in light rich soils. Control is with poison baits, dusts, or irrigations for long periods after sprouting time.

Use 10 percent DDT and a high percentage of 325-mesh conditioned dusting sulphur mixture applied at the rate of 15 pounds per acre by ground machinery for good control. An alternate material is an apple-peel bait applied at the rate of 10 pounds per acre between the rows. (Apple-peel bait is dried apple peel impregnated with sodium fluosilicate.)

SUCKING INSECTS

• **Lygus Bugs, Stink Bugs, Superb Plant Bug, and Cotton Flea Hoppers**—These are the most important sucking insects of cotton. They feed on squares or bolls of the cotton plant. The stink bugs cause more injury to cotton bolls and stain the lint.

Use 10 percent DDT and a high percentage of 325-mesh conditioned dusting sulphur applied at the rate of 15 pounds per acre to control all of the sucking and chewing insects, except the stink bug, spider mites and salt marsh caterpillars. Research work shows also that 20 percent toxaphene and a high percentage of 325-mesh conditioned sulphur is effective when applied at the rate of 15 pounds per acre per application.

Sprays are equally as effective as dust. Be certain the same amount of technical material is used per acre. Do not use more than 4 gallons of material per application. Extremely rank cotton may require a higher gallonage per acre.

A 5 percent DDT, 2 percent gamma isomer benzene hexachloride, and a high percentage of 325-mesh conditioned sulphur will give best control of stink bugs when applied at the rate of 15 pounds per acre per application. If a spray is used, be certain to apply not less than 4/10 of a pound of gamma isomer benzene hexachloride per acre.

An alternate dust is 5 percent DDT, 15 percent toxaphene and a high percentage of 325-mesh conditioned sulphur applied at the rate of 15 pounds per acre. If liquids are used, an alternate may be 2 pounds toxaphene, 1 pound DDT emulsion in 4 gallons of water per acre.

Dieldrin in a 2½ percent dust with sulphur when applied at 15 pounds per acre will also give control. Also a 20 percent toxaphene and sulphur dust applied at the same rate will give controls. Injury by superb plant bug is found primarily in the Safford Valley.

• **Thrips (Chewing Insect)**—Thrips may and do cause serious damage to young seedling cotton plants. Not all fields are infested, but when thrips are present they can cause serious injury to the plants.

In 1951, Mr. Stevenson and workers of the Bureau of Entomology and Plant Quarantine found a profitable increase of seed cotton per acre where an application of 10 percent toxaphene dust was applied at the rate of 10 pounds per acre with a ground duster. The dust was applied when the cotton plant was in the 4 to 6 leaf stage of growth.

A spray mixed so as to deposit 1 pound technical toxaphene or ½ pound of DDT per acre is also effective. A 5 percent DDT dust applied at the rate of 10 pounds per acre has also given good results. Also, 2 ounces of dieldrin in 2 gallons of water, or 2½ percent dieldrin dust will give good control.

Start control measures when thrips are found on the small plants, and the leaves are curling. Thrips not only retard plant growth, but blast very small squares.

• **Aphids or Cotton Lice (Sucking Insect)**—Aphids sometimes cause serious injury to cotton in all stages of growth. The worst injury is caused by their presence on plants when cotton bolls are open. The "honeydew" that they excrete injures the quality of the lint.

Benzene hexachloride at the rate of ½ pound of the gamma isomer per acre gives a "knockout" of the aphids. One percent parathion dust applied at 15 pounds per acre is also effective. Follow directions when using.

• **Bollworm (Chewing Insect)** — The bollworm feeds on both squares and bolls of the cotton plant. It must be controlled when it first appears in the tops of the cotton plant.

Use a 10 percent DDT and a high percentage of 325-mesh conditioned sulphur at the rate of 15 pounds per acre per application. An alternate dust of 20 percent toxaphene and a high percentage of 325-mesh conditioned sulphur will give control at a slower rate when applied at 15 pounds per acre per application.

Sprays may be used if the same amount of technical DDT or Toxaphene per acre is used as with dust. The sprays must be applied at the correct time or when the worms first hatch. Otherwise very poor results will be secured.

• **Cotton Leaf Perforator (Chewing Insect)**—This insect causes the greatest injury to stub cotton. However, it may become injurious to planted cotton. Due

Agriculture Has An "Ellis Island"

On the waterfront at Hoboken, N. J., is an "Ellis Island" for agriculture where USDA examines incoming plants and plant material and determines whether it can be admitted to this country without bringing harmful insects or diseases. Plant material arrives under customs bond and remains there until all customs, plant quarantine and other requirements are met. The station is kept locked, and many precautions are taken to prevent the spread of insects or diseases.

Other quarantine stations are maintained by USDA at leading ports and border points of entry for agricultural material, most of which must be treated with methyl bromide before it can be released.

These Materials Are Recommended For Use On Cotton During 1953 in ARIZONA

DUSTS

Label	Contents
1. 5-60 to 75	5% DDT-60 to 75% Dusting Sulphur
2. 10-50	10% DDT-50 to 60% Dusting Sulphur
3. 10-40	10% Toxaphene-40% Dusting Sulphur
4. 20-40	20% Toxaphene-40% Dusting Sulphur
5. 2-5-50	2% Gamma Benzene Hexachloride-5% DDT-50% Dusting Sulphur
6. 15-5-40	5% DDT-15% Toxaphene-40% Dusting Sulphur
7. 2.5-50	2.5% Dieldrin-50% Dusting Sulphur
8. 1 or 2	1% Parathion Dust

SPRAYS

Name	Pounds Per Acre
1. Toxaphene	1.0-2.5-3.0
2. DDT	1.0-1.5
3. Benzene Hexachloride	0.4-0.5 gamma isomer
4. Dieldrin	.25 to .5

to its habits of feeding only short periods, it is difficult to control.

A 10 percent DDT and a 325-mesh conditioned sulphur will give good results when applied at 15 pounds per acre.

• **Spider Mites** — Several species of spider mites (not true insects) may appear in cotton fields in great numbers during 1953. In most cases, an application of 30 to 40 pounds of 325-mesh conditioned sulphur should give good control.

There may be some species that show a resistance to sulphur. Materials including aramite, parathion, as well as others have shown promise. Any new recommendations will appear in the weekly cotton insect reports during the summer of 1953.

Aramite, 1 pint per acre in 3 to 5 gallons of water has looked very promising. A 3 percent dust has also looked very good.

Systox has been used in some western states at the rate of 3 ounces per acre as a spray with good results. No experience with it on cotton in Arizona has been reported.

• **Salt Marsh Caterpillar** — The salt marsh caterpillar, also known as "wooly worm," may cause some injury to cotton. All stages of this worm may be controlled with a dust mixture of 5 percent DDT, 15 percent toxaphene, and a high percentage of 325-mesh conditioned sulphur. Apply at the rate of 20 to 25 pounds per acre per application.

A mixture of 1 pound of technical DDT and 3 pounds of technical toxaphene in an emulsion form is effective as a spray for control of this insect.

• **Leaf Roller**—A leaf roller has been causing some injury in some parts of the state. Early in the season either a 10 percent DDT or 20 percent toxaphene dust has worked well. Late in the season the 20 percent toxaphene dust has looked the best.

• **Seed Corn Maggot**—The seed corn maggot has been injuring cotton in the seedling stage. Research workers have found 2.66 ounces of 75 percent lindane per 100 pounds of seed to be very effective when thoroughly mixed. Also, 4 ounces of actual chlordane to 100 pounds of seed is effective.

• **Pink Bollworm**—Farmers in those regions where the pink bollworm has been found should get ready at once to combat this insect. If the cotton has been picked it is wise to follow these rules:

1. Endeavor to pick cotton as clean as is possible since the larvae feed in the small seed.

2. If cattle or sheep are available the fields may be pastured rather clean as a means of cleaning out all seed cotton.

3. If you do not have livestock to place in the fields, you should start cutting the stalks with a good stalk cutter of the rotary type, as soon as harvesting is completed. Experiments by the Bureau of Entomology and Plant Quarantine have shown that best results have been secured with a six-blade stalk cutter known as a shredder. This cuts the stalks into small lengths and usually destroys 50 percent of worms in the unpicked bolls and stalks.

4. Next, plow your land with a moldboard plow. Best results have been secured when the plow is set for 10 to 12 inches, so that it completely turns over the soil. Repeated tests have proved that

Keep Fields Bug-Free in '53

New pest control methods under study, but

OUR JOB TODAY

is to make the BEST use of our present knowledge and materials

IT IS WITH real pride that we present this Sixth Annual Cotton Insect Control Issue to our readers from California to the Carolinas. We feel it is the most valuable in the series. In its many special articles will be found much new thinking on the subject of successful control of cotton pests.

Here you will find the control recommendations of the 14 major cotton-producing states, the Memphis Conference Report of research entomologists, and a mass of information found in no other publication.

While we are going about our job of holding down insect damage with the many excellent materials we now have, research people are busy seeking not only new materials but entirely new methods of controlling cotton pests.

One of these, systemics, is discussed in this issue by E. E. Ivy. While he warns of the many difficulties researchers must overcome in this field, there is promise that new systemics will be developed which could materially alter cotton pest control as we know it now.

Still another method of pest control under study is insect resistance in the cotton plant itself. T. R. Richmond has contributed an article on the subject for this issue that is of unusual interest.

It is the researchers' job to find improved methods of control; ours is to make full use of those we have today. How well we employ them this year, and the next, will have an important bearing on acre yields and cost of production. This year's mild winter points to high overwintering boll weevil populations. This pest is still king of the cotton insects, even though the pink bollworm has been stealing the headlines for the past two years.

The pink bollworm, it has been found, is best controlled through the adoption by growers of practical farm management methods. Insecticides help, and there are times when heavy applications are needed in some areas. But the grower who follows the 12 approved steps outlined by C. B. Spencer in the Jan. 31, 1953, issue of The Cotton Gin and Oil Mill Press is likely to find that any pink bollworm damage on his farm is light. Moreover, he will produce more lint and seed at lower cost even if no pink bollworms ever show up in his cotton.

The intensive educational work in the field of insect control over the past five or six years has done much to persuade farmers that pest control works best when it is made a standard practice in cotton production. No one expects that every farmer, every year, will give his crop maximum protection from cotton pests, nor will our educational job with growers ever come to an end. Still, we have made great progress in farmer education and there is reason to believe that 1953 will be a good year from the standpoint of applying the right poisons at the right time.

It is felt that there will be ample supplies of insecticides for the coming season. Extension and Experiment Station personnel in all the cotton states are familiar with the new materials; many growers have had several years' experience with them; and application equipment has been greatly improved. We need only to use our present knowledge to do a satisfactory job of cotton pest control.

Ginners and crushers, because of their frequent and close contacts with growers, are ideally situated to aid materially in our continuing job of grower education on the use of insecticides. The best advice they can give the farmer is to ignore hearsay and rumors, and follow the control recommendations of his own state Extension Service. Ginners and crushers can help, too, by urging growers to anticipate their needs and get in their supplies of poisons early.

There need be no cases of extreme damage from cotton pests this year if everybody involved in the insect control program carries out his responsibilities.

worms buried deep are killed. Follow this plowing with an irrigation that will wet the soil to a depth of 10 to 12 inches.

5. For insecticidal control, see the weekly cotton insect reports.

SUGGESTIONS

If salt marsh caterpillars should appear in August, be sure that you control them with the recommended insecticides at once.

There are many types of ground spray equipment for sale. Be sure to secure one that gives a good coverage of the plant from bottom to top at all times and gives 60 pounds of pressure of more.

Some crops may be injured by cotton dusts. Never use a dust containing sulphur adjoining or near cantaloups or similar melons. Honey bees may also be injured by some insecticides, so consider your beekeeper when dusting or spraying.

Systox has been used by some cotton growers with good controls of both aphids and spider mites. There is no information on its use in Arizona. In California, 4 to 6 ounces of systox in a spray by either ground or airplane application has looked good for mites and aphids. However, this may not be effective in Arizona.

For further information on controlling cotton insects, see the County Agricultural Agent in your county. He can help you with information regarding conditions in your locality.

1953 Cotton Insect Control Recommendations for:

Arkansas

Cotton insects can be controlled with insecticides applied at the **RIGHT TIME** and in the **RIGHT PLACE.** Insecticides applied for the control of one insect often create outbreaks of other insects, by destroying beneficial insects. To avoid this, cultural control measures should be utilized and insecticides used in the manner least likely to bring on outbreaks of other pests.

BOLLWORMS

Bollworms on cotton are the common corn earworm and the tobacco budworm. Natural outbreaks of bollworm often occur independent of insecticidal treatments. However, use of organic insecticides destroys insidious flower bug, big-eyed bug, and other predatory insects that help to prevent bollworm outbreaks. Aphid infestations help bring on bollworms because bollworm moths are attracted to honeydew, and because beneficial insects that might eat bollworm eggs are busy eating aphids.

Bollworm eggs are pearly white and about the size of a pinhead. They can be seen on the upper surface of the terminal leaves. Newly hatched worms tunnel through the terminal growth and bore into tiny squares. These squares turn brown or black. The small worm hole can be seen going through the squares. Larger worms move down the plant, boring into squares and bolls.

Control of Bollworm Before Bolls Are Formed

Bollworm eggs and small worms may be abundant in late June and early July. Tobacco budworm is likely to be the common species in these early infestations. If insectidices have not been used, natu-

More Research Is Badly Needed

By J. F. McLAURIN

President, National Cotton Ginners' Association

■ THE GREATEST problem facing cotton today in terms of pest control is how to kill the bugs and at the same time make it profitable to produce cotton. Effective control at extremely high prices per acre means nothing to the farmer. Effective control at low per-acre cost **will** keep in him in business.

A review of the total cotton insect control research program indicates a deplorable absence of adequate funds to do the job. Industry leaders should—**must**—direct every possible effort toward a stimulated flow of funds and energy to provide the vitally needed money and manpower necessary for an efficient program of research and education on insect control. The National Cotton Council's campaign on this subject is excellent and should warrant the full cooperation of every ginner in the Cotton Belt.

ral control is almost always excellent and few worms become large. Even though large worms may be common, they can do little damage because of the absence of bolls. In some cases a fairly high percentage of squares may be damaged.

If bollworms are damaging more than 25 percent of the squares, insecticides may be applied to control them. A bollworm damaged square can be recognized by a clean round hole about 1/16 inch in diameter.

Control of Bollworm in Late Season

Damaging outbreaks of bollworm usually occur from the middle of July through August. Inspect terminal growth for bollworm eggs and small worms at least once a week or each time the cotton is scouted for weevils. Count 100 terminals in a field. If an average of 4 or 5 small worms, plus additional eggs, are found to 100 terminals it is usually time to apply insecticides.

In fields that have not received any insecticides, treatment may be delayed a few days to give beneficial insects a chance to destroy an infestation. It was demonstrated in 1952 that beneficial insects are capable of controlling heavy outbreaks of bollworms. Careful scouting is required so an outbreak can be stopped before it breaks through to the larger squares and bolls. Larger worms are difficult to control and require heavier applications of insecticides.

Insecticide applications should be made at intervals not to exceed 5 days and continued until infestations are brought under control. At least three applications are usually necessary.

• **Trap Crop**—Since the corn earworm is the common bollworm in late season, planting small acreages of corn to silk at the right time will protect cotton from bollworm injury. In Arkansas the critical period of egg-laying is July 15 to August 10. Two plantings of corn spaced two weeks apart will furnish fresh silks throughout this period.

BOLL WEEVIL

To successfully control boll weevil one must know something of the habits and life cycle of the boll weevil and be able to recognize punctured squares and the stages of the boll weevil (weevil, grub, pupa).

Insecticides are aimed at killing the adult weevil, since this is the only stage not passed inside a square or boll. The period from the time an egg is laid until the adult weevil emerges is about 16 days in favorable weather. Inside the square the egg, grub and pupa stages are passed. The adult feeds for 7 or 8 days before laying eggs. From generation to generation takes about 25 days during summer weather and longer in cool weather.

Boll weevils like warm, moist summer weather. Under these conditions a small winter carry-over may build up to damaging numbers by the end of the season, as in 1948. Hot, dry weather slowed down a potentially destructive outbreak in 1952.

Boll Weevil Punctures

Correct timing and placing of insecticide depends on scouting. This requires ability to recognize the two types of boll weevil punctures, as well as other insects and their damage. The feeding puncture is a small open hole on a square or boll, usually near the tip. Many such punctures may be found in a single square. Bright yellow castings indicate feeding.

An egg puncture is usually near the base of a square. Usually one egg is laid in a square, after which the hole is closed by packing it full of castings. A blister or swelling that can be easily felt with the finger, is formed where an egg is laid. A few days after a square is punctured, it flares—that is, the bracts spread apart. In a few more days, the square turns yellow and falls off.

Control of Overwintered Weevils

Weevils overwinter in grass, trash, and leaves. They come out of hibernation from March until July. Many weevils die before squares are available.

Weevils can be readily seen in terminals of cotton plants. Insecticides may be applied when squaring begins, if overwintered weevils are numerous. A second application may be made one week later, if weevils are still present. These applications will not replace control measures later in the season. Such applications should usually be confined to large, early cotton and to that near favorable hibernation quarters. Treating large areas and making repeated applications encourage outbreaks of bollworm, aphid, and red spider, without corresponding benefits in weevil control.

Overwintered weevils lay eggs in squares and soon die. The damaged

squares may not be noticed until they flare, by which time the old weevils are usually dead. Infested spots, if marked, guide later scouting and dusting.

Control of First Brood Weevils

About five weeks after squaring begins, a new brood of weevils emerges. They are the first to mature in the current year. After a week of feeding, they begin to lay eggs and migrate short distances, usually within a field.

Beginning four weeks after squaring starts, green squares should be inspected once a week for fresh punctures. Special attention should be given to spots where flared squares were found earlier. Most fresh punctures will be feeding marks. Egg-laying begins in a few days.

• **Spot Dusting**—In case of spot infestation, dusting should begin as soon as first brood weevils begin to emerge, as indicated by freshly-punctured squares. Infested spots and cotton for several yards in each direction are dusted. Applications should be repeated every four days as long as fresh punctures are found. Scouting should be continued, looking for new spots. Spot dusting gives maximum weevil control at low cost with little risk of bringing on outbreaks of bollworm, red spider, and aphid.

• **Blanket Dusting**—If an infestation is generally distributed over a field, field-wide or blanket dusting becomes necessary. In making counts to use as a basis for blanket dusting, medium-sized squares are picked. Flared squares or small squares are not included. An estimate of the infestation should be based on at least 200 squares in each 10 acres. As much of a field as possible should be covered to get a representative sample. **With a moderate infestation and normal weather, applications should begin when about 25 percent of the squares are punctured.**

A rapidly-rising infestation is indicated by feeding punctures and an increase in the percentage of squares punctured. Wet weather favors weevil development. **Dusting should begin when 10 or 15 percent of the squares are punctured, if it is a rising infestation in damp weather.**

A stagnant or falling infestation is indicated by egg punctures, instead of feeding punctures, and by little change or a drop in percentage of squares punctured. Dry weather kills weevil grubs and pupae in the squares. **With a stagnant infestation in dry weather, dusting is not necessary unless 35 to 40 percent of the squares are punctured.**

Repeat applications every four days until the infestation is brought under control. Keep scouting to determine progress of infestation and effectiveness of control. Watch for aphids, bollworm and red spider.

Control of Later Brood Weevils

About four weeks after the first-brood weevils emerge, the second-brood weevils begin to emerge from squares punctured by the first-brood weevils. The second brood usually develops faster than the first, since temperatures are higher in July than in June. Second-brood weevils emerge before the last of the first brood die, and there is usually no weevil-free period at this time. Third and fourth broods follow in rapid succession. Heavy weevil flights occur when the supply of squares is exhausted.

Quotes From Our Authors:

"UNLESS cotton growers carefully plan and conduct their insect control program each year as they do fertilization, seedbed preparation, cultivation and harvesting, they cannot expect to obtain consistently profitable results."—H. G. JOHNSTON.

In outbreak years like 1949 and 1950, these weevils are so much more numerous than first-brood weevils that control is more difficult. However, regular dusting will enable infested fields to continue fruiting, and will delay or prevent migration of weevils from dusted fields. This protects uninfested fields from migrating weevils, and makes it easier for all farmers to protect their cotton.

Dusting must continue until bolls are at least 16 days old. Quitting too early results in loss of much of the benefit of control already accomplished. As plants mature, the percentage of punctured squares rises because of scarcity of squares. But you can still get boll protection.

APHIDS (Plant Lice)

Aphids (plant lice) are small, yellowish-green, soft-bodied insects found on the undersides of cotton leaves. They suck sap from plants and excrete honeydew, a sticky liquid on which sooty mold grows. Plants shed their leaves because of aphid feeding. Honeydew and the ac-

companying sooty mold lower the grade of the lint.

Aphids multiply rapidly. Fortunately, lady beetles and other insect enemies keep them under control most of the time. However, boll weevil control kills these beneficial insects. Spot dusting seldom causes aphid outbreaks because beneficial insects move back into treated spots.

Each time cotton is scouted, aphids should be counted. Select the fourth leaf down on the center terminal. Leaves on several plants should be counted. If an average of more than five aphids are found to the leaf, they should be controlled.

Aphids can be controlled with **3-5-40 (BHC).** The insecticide should be applied late in the afternoon when the air is calm. Morning treatment is not as effective.

Toxaphene used in every application for boll weevil control does not cause buildup. It will not knock out an established infestation. In general, the same is true of Aldrin, Dieldrin, and Heptachlor, but aphid outbreaks sometimes develop following use of these insecticides. Calcium arsenate is likely to cause an aphid outbreak which will necessitate an application of 3-5-40.

RED SPIDER

Red spiders are red or tan mites, barely visible to the naked eye. They live on the undersides of leaves and suck sap from leaves, causing the upper surfaces to turn red. In severe infestations, leaves fall off. Dry weather favors red spiders. They cannot fly, but are spread through a field mechanically on cultivating equipment and the like.

Predatory and parasitic insects ordinarily keep red spider mites under control. New organic insecticides, such as BHC, DDT, Toxaphene, Aldrin, Heptachlor and Dieldrin, kill these beneficial insects, but do not kill the red spider.

Each time cotton is scouted for boll weevils, plants adjacent to turn-rows, field margins, and stumps should be inspected for red spider. Look for red leaves or for white stippling on the upper surface. Look on the undersides of the leaves to find the mites.

To prevent spider mites, low-growing plants such as violets and wild strawberries, which are green in winter, should be destroyed in turnrows and from around field margins and stumps. This destroys winter hosts. To prevent build-up, insecticides should be use wisely, and all the organic insecticide dusts should contain 40 percent of sulphur.

Treatment should begin when red spiders are found. This can often be limited to spots, unless mites have been spread over the field. An effort should be made to apply treatment to underside of leaves.

Recommended miticides are DN-Sulphur mixture (0.5 percent dinitro-ocyclohexylphenol), ten or more pounds per acre, used as dust only. Aramite is a new organic sulphur compound that gives good results at high dosages, 0.6 to 1.0 pound technical material per acre. It can be used either as a dust or concentrate spray.

RECOMMENDED INSECTICIDES

Satisfactory insect control may be secured by the proper use of any of a number of insecticides. In a recent conference of cotton entomologists, none of the recommended or substitute materials was reported as having given results better than any other. In the experimental work reported, such variations as occurred were within the range of experimental error. Success in control still depends on timing.

• **Precautions**—Calcium arsenate, Toxaphene, DDT, DN-Sulphur and Aramite are safely handled with ordinary precautions. BHC (3-5-40 or 3-10-40) and nicotine often cause nausea but are otherwise safe to handle with normal precautions.

Aldrin, Dieldrin and Heptachlor are more hazardous. Illnesses have been known to occur following their use. They may accumulate in the body and cause ill effects later. Extreme care should be taken in handling these insecticides. Unnecessary exposure should be avoided since they can enter the body through inhalation, ingestion, and skin absorption. Protective clothing should be worn. A good respirator should be worn over the nose and mouth. Hands should be washed thoroughly before food is handled. After spraying or dusting operation, the operator should bathe and change clothes.

Parathion, TEPP and Systox are organic phosphate compounds with extreme hazard to the operator. They are not recommended in Arkansas because of this hazard.

• **Calcium Arsenate**—Excellent for boll weevil control. Repeat applications that are washed off before an entire daylight period has passed. To prevent build-up of aphids, use 3-5-40 as needed. Of the recommended insecticides, calcium arsen-

(Continued on page 82)

Keep Fields Bug-Free in '53

Future May Give Us Insect Resistance in Cotton

"The odds against success (of breeding for insect resistance), however great they may be, cannot possibly outweigh the benefits to be derived from just one reasonably resistant strain."

By T. R. RICHMOND

T. R. RICHMOND is Agronomist, Bureau of Plant Industry, Soils, and Agricultural Engineering, USDA, and Professor of Agronomy, Texas A.&M. College, College Station.

EACH TIME a cotton insect breaks out of its old confines and threatens a new and larger area of the Cotton Belt, the proposition of producing a resistant type is put squarely up to the plant breeder. This was true thirty odd years ago when the boll weevil threatened the entire American cotton industry. Pessimism and apprehension were general and banner headlines across the Belt darkly predicted economic disaster. That the plant breeder rose to the occasion is attested by our modern, early maturing, rapid fruiting varieties which replaced the old, weevil-susceptible, late maturing types. This development represents one of the most outstanding plant breeding achievements in history. True enough, we still have the boll weevil with us and we still have to dust and spray; but imagine what we would be up against if we had to depend on chemicals alone for the control of insects on varieties that reached their peak period of blooming in August, at a time when the weevil not only is present in greatest numbers but is migrating!

The recent "break out" of the pink bollworm from a few counties in South Texas and its rapid spread northward and eastward has again focused attention on breeding cotton for insect resistance.

In Professor Painter's recent book*, resistance of plants to insect attack in practical agriculture is described as "the ability of a certain variety to produce a larger crop of good quality than do ordinary varieties at the same level of insect population." There are nineteen or twenty species of cotton and a large number of varieties and strains. And there are literally thousands of species of insects. Fortunately, only a relatively few insect species attack cotton; plant resistance to those which do is exhibited in many ways. On rare occasions a variety or strain may show no signs of injury while others in the same field will be severely damaged. Such a variety is said to be **immune.** Complete immunity, while highly desirable, is seldom found and hardly to be expected. Plants under test for insect resistance usually range from **susceptible** (more than average damage) to **highly resistant** (small amount of damage) **Moderately resistant** types fall in between.

Information on the nature, causes and mechanisms of resistance is not absolutely essential to success in the practical development of resistant agricultural varieties, but in most instances such information accelerates the breeding advance and often is essential to the solution of difficult problems. Certain insects seem to prefer one cotton variety over another for egg laying or for food. In other cases a variety may show an ability to grow, repair injury, and produce a good crop in spite of supporting an insect population equal to that causing economic losses in nearby, susceptible varieties. Still other plants, strains or varieties may owe their resistance (to insects) to their ability to produce adverse effects on the attacking insect. In such cases the resistant plants contain certain chemicals, show peculiar physiological reactions, give off odors or gases, have certain color or light responses, and for these and many other reasons, are able to disrupt the life cycle of the insect. These are only a few examples of the many complex and interacting factors which may contribute to insect resistance in cotton.

The saving of the European grape industry some eighty years ago by introduction of American root stock which was resistant to the attacking insect, the grape phyloxera, often is cited as a classic example of insect resistance in plants. No less spectacular has been the development of leafhopper resistant strains of cotton by British workers in Africa. There a leafhopper, commonly called the jassid, became a damaging pest of major proportions in the early twenties. But by now plant resistance is so firmly established that jassid damage is no longer an important factor in commercial production. Jassid resistance is attributed to a heavy covering of long plant hairs, particularly on the leaves. Practically all of the resistance in varieties grown in South Africa traces back to a single plant selection made from a stock of Upland cotton in 1925.

Fortunately the leafhopper causes no significant damage in the American Cotton Belt but we have trouble enough without it. Information obtained from a review of the literature on the resistance of cotton to insects reveals a surprisingly large number of references to work by American scientists. The breeding of early maturing varieties which make cotton production under boll weevil conditions possible has been mentioned. Strictly speaking, this is evasion or "false resistance" in as much as the plant characteristics actually do not discourage the weevil, interrupt its life cycle or hinder its feeding or egg laying habits. But if other control measures are taken, our modern varieties are inherently capable of producing a good crop before the boll weevil reaches its peak stage of damage. As already emphasized, these characters are of tremendous economic importance. In addition to the "escape" mechanism developed in our better, present-day varieties there are indications that a slight degree of true resistance may be present in certain types and strains. It is well known that Sea Island varieties are more susceptible to the weevil than Uplands under comparable conditions.

Thrips and plant lice (aphids) cause considerable damage to cotton, particularly in the seedling stage. Tolerance of thrips has been reported in varieties of Upland cotton and it has been found that plants may be resistant to one species of thrips but susceptible to another. Workers at the Mississippi Delta Branch Experiment Station and elsewhere have reported degrees of resistance to aphids. Types with smooth leaves had fewer aphids; the insect population increased in direct proportion to the number of hairs on the lower leaf surfaces.

At the Texas Agricultural Experiment Station it has been shown that alternate host plants, and other ecological conditions, are related to damage to cotton by the cotton fleahopper. Under light infestations some varieties lost few small squares while other varieties, under the same conditions, lost considerably more. Other workers, both American and foreign, have found indications of resistance to the fleahopper.

An insect bearing the scientific name, **Heliothis armigera**, damages corn, tomatoes, cotton and several other plant species. It goes by several common names depending on the plant under attack; on corn, it is the corn earworm; on tomatoes, it is the tomato worm, and on cotton it is called the bollworm. Significant evidence of plant resistance to the worm has been found in corn and from this it may be inferred that resistant cottons might be developed through intensive experimentation.

And now we come to the pink bollworm. Here we have a surprisingly large

*Painter, Reginald H. Insect Resistance in Crop Plants. The Macmillan Company. New York. 1951. Interested readers should refer to this excellent text for more detailed, technical information. Chapter on "Resistance to Insects in Cotton," pages 276 to 325 with 186 references.

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Here's new, proven control of boll weevils and other bothersome costly cotton insect pests. It's new Heptachlor, fully approved for cotton insects by the Federal Government and cotton-raising states. So powerful, you'll be surprised how little you have to use to do an effective job . . . on boll weevils as little as four ounces to the acre per application. And such applications control a wide variety of other cotton insect pests at the same time. Heptachlor is also tops in economy.

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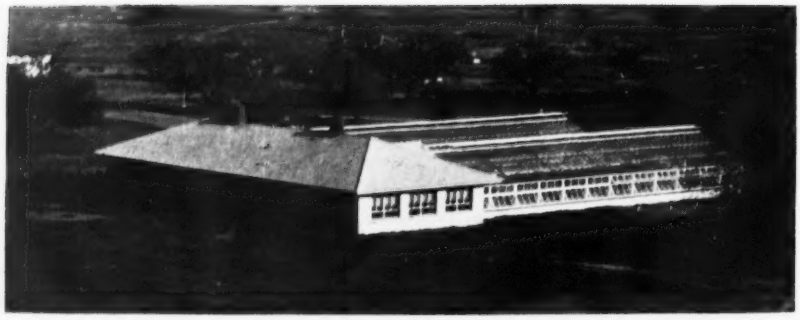


THE BEASLEY LABORATORY, at Texas A. & M. College, is a center for basic work in cytogenetics.

number of references to resistance, some of which are quite encouraging. A native cotton in Haiti, which belongs to the same species as our cultivated American Upland cotton, is reported to show considerable resistance to the pink bollworm. There have been indications of resistance among the native cottons of India but the various experiments are somewhat inconclusive and contradictory. Probably the best examples are those given by British workers in Africa showing the resistant qualities of Arizona wild cotton. This commercially worthless shrub grows wild in Southern Arizona and Northwest Mexico. Not only has this wild cotton shown resistance to pink bollworm in pure stock, but it appears to confer resistance to certain segregates in hybrids with cultivated species, including American types. At the Shambat Substation in the Anglo-Egyptian Sudan a breeding program is in progress in which an attempt is being made to transfer pink bollworm resistance from Arizona wild to cultivated Egyptian varieties. Pink bollworm resistance also has been reported in three other wild cotton species, two occurring in Africa, and the third in the region of the Gulf of Lower California.

A prime requisite of a plant breeding program is to have available, or to make available, primary breeding stocks which carry, or may produce, the character to be investigated. The possibility of utilizing the pink bollworm resistance now belived to be present in certain wild cotton species will be used as an example of what might also be done in breeding for resistance to other damaging cotton insects.

For the past fifteen years a basic research program in cotton cytology and genetics has been in progress at the Texas Agricultural Experiment Station. The various species of cotton have been assembled and, through the utilization of a special method involving treatment of sterile hybrids with the drug, colchicine, it has been possible to hybridize several of the wild cottons of the world with cultivated American Upland varieties. More recently a regional program of research in cotton genetics has been organized with the Texas Station as headquarters, and fundamental research with species hybrids is now in progress in several states, including Mississippi and North Carolina. Under this program, and in addition to the species collection, a large number of types have been collected in an area in Mexico and Central America which is believed to be the center of origin of our cultivated Upland cottons. A better understanding of the problem involved will be had when it is pointed out that there are three major classes or groups of cottons: (1) the truly wild cottons which have 13 pairs of chromosomes (chromosomes carry the units of inheritance); (2) the Asiatic or Old World cultivated, which also have 13 pairs of chromosomes; (3) the American or New World cultivated, which have 26 pairs of chromosomes and which are believed to have resulted from the natural doubling of the chromosimes of a cross between an Asiatic and an American wild type.

The first fertile cross between members of the two major chromosome groups was produced by doubling a sterile hybrid between Asiatic and Arizona wild to give a fertile hybrid with 26 pairs of chromosomes. The fertile hybrid was, in turn, crossed with a 26-chromosome cultivated Upland variety. When the new 3-species hybrid, thus produced, was back-crossed to Upland it was found that fiber strength in several plants in the progeny increased materially over anything previously known in the Upland cotton. This, of course, was quite unforeseen as the Asiatic parent was by no means outstanding in respect to fiber strength and the Arizona wild parent had no spinnable fibers at all. Lines more than 30 percent higher in fiber strength than regular Upland varieties have been selected from this hybrid and some of these lines are developing a fairly acceptable level of yield.

It is remarkable that one of the parent species, Arizona wild, of this 3-species hybrid is reputed to be resistant to the pink bollworm. Considering the great number of extracted lines now under investigation for fiber properties, the initiation of a substantial program of breeding for pink bollworm resistance certainly will not be held up for want of suitable breeding material. The Asiatic-Arizona wild-Upland hybrid, as well as the other species hybrids that have been produced, affords valuable material for experiments in resistance to other cotton insects as well. As in the case of high fiber strength, insect resistance may show up in the hybrid progeny even though none of the parents show resistance. The extensive collection of primitive Upland stocks constitutes an additional, and to date, untested source of possible insect resistance.

Though insects annually take a toll of millions of dollars from the American cotton crop, plant breeders and entomologists have given only scant attention to carefully designed and fully executed programs of breeding for insect resistance. Chief among the reasons for this deficiency are the technical difficulties inherent in research in this field and the expense of conducting a really comprehensive experiment. The difficulties are almost too numerous to mention. We need only to think of the problem of confining a population of insects to a certain test plot, while keeping all insects out of a nearby check plot, to realize what is involved. But the odds against success, however great they may be, cannot possibly outweigh the benefits to be derived from just one, reasonably resistant strain. The field is wide open; let's get on with the job!

Insects and Defoliation Topics for Conference

How cotton growers in Western areas can increase efficiency of insect control and defoliation will be outlined April 8-9 at the Western Cotton Insect Control and Defoliation Conference at the Westward Ho Hotel, Phoenix, Ariz.

Invited to attend are growers and others from the El Paso area of Texas, New Mexico, Arizona, California and Nevada.

Sessions during the first day will deal with all phases of cotton insect control. Defoliation problems will be discussed during the second day. One session may be scheduled to study use of herbicides in cotton weed control.

Taking part on the conference program will be authorities from federal and state agricultural agencies, insecticide and defoliant manufacturers, spray and dust applicators, and cotton industry representatives.

The Five-State Cotton Growers Association and the National Cotton Council are sponsors. Local host will be the Arizona Cooperative Cotton Growers Association.

U.S. Insects Helped Destroy Cactus

Prickly pear continues to be a major nuisance for ranchmen in the Southwest, but U.S. insects that prey on cactus have helped Australia to reclaim millions of acres of land that once were useless because of prickly pear. Done at a cost of a fraction of a penny per acre, the project is a notable example of beneficial use of insects, says USDA.

Cactus plants, which had been taken to Australia for culturing cochineal insects for dye, had spread over the country until 60 million acres were affected by 1925, about half of the acreage so densely covered as to make the land useless. From 1920 to 1937, more than half a million insects of 50 species were imported by Australia from North and South America in efforts to control the cactus. These parasites helped to check the spread of the plant, but it was not until 1930 that hope of controlling the pest seemed justified.

Three billion eggs of a moth from Argentina, *cactoblastis cactorum*, within seven years destroyed the last dense growths of prickly pear, with the result that the land was reclaimed for settlement and use for livestock production. The cost was only a small fraction of what would have been spent for control through mechanical and chemical methods previously used.

• How Many Insects? —Nobody Knows

NOBODY KNOWS exactly how many insects there are in the world, or even how many different kinds of insects there are, says USDA's 1952 Yearbook of Agriculture. Various scientists have estimated that 625,000 to 1,500,000 different species have been described and named. Each year about 6,000 to 7,000 kinds of insects are described and named for the first time.

A mere list of the scientific names of the known insects, without one word of description or anything else, would take 3,300 pages of a book of the usual page size.

New Bulletins:

SPRAYING SYSTEMS CO. OFFERS THREE NEW BULLETINS

Spraying Systems Co., manufacturers of the TeeJet line of farm spray nozzles, has published three new bulletins, featuring the BoomJet Spray Nozzle, the GunJet No. 2 Spray Gun, and the Trigger TeeJet.

Bulletin 65 gives complete information about the GunJet No. 2, the heavy duty adjustable spray gun, for such applications as orchard spraying, cattle spraying, and the spraying of hard-to-get-at weeds and scrub growth. This bulletin also describes the GunJet No. 2-A, identical to No. 2 except that the barrel is shorter in length. Both spray guns are heavy duty units for pressures from 30 to 800 lbs.

Bulletin 66 presents, for the first time, complete flow charts and describes the BoomJet Spray Nozzle. For certain applications such as weed killing in grains and grasses or the spraying of liquid fertilizers, the BoomJet may be tractor mounted to take the place of a spray boom. The single BoomJet nozzle will provide a spray pattern up to 66 feet wide. The full range of capacities, and spray pattern width at different pressures is described.

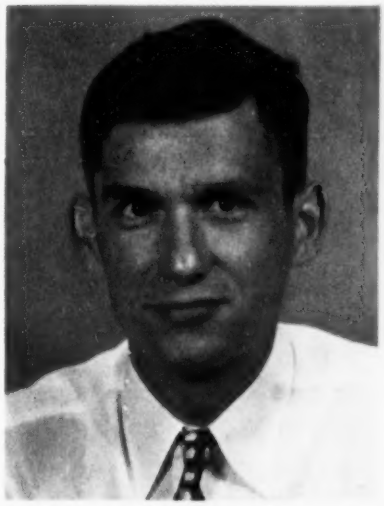
Bulletin 67 gives complete information on the comprehensive Trigger TeeJet line for 1953. The Trigger TeeJet is a hand valve unit designed for use with hand-held or shoulder-held tank for portable spraying. The Trigger TeeJet line includes five types of shut-off valve assemblies plus a new assembly with strainer built into the handle. This is all described in the bulletin, along with interchangeable orifice tips, adjustable tips, extensions, swivel nozzle bodies, and adaptors.

For copies of any of these bulletins, write the manufacturer, Spraying Systems Co., 3270 Randolph Street, Bellwood, Illinois.

Wilt Improvements Found In Tulare Cotton Tests

Tests conducted last season on two cotton ranches in Tulare County, Calif., on land where wilt was known to be a problem, showed progress in improving Acala 4-42 cotton for tolerance to verticillium wilt, says Alan G. George, farm advisor.

Last season wilt development was more favorable because of the below normal temperatures during the spring, George says. However, Acala 4-42 WR, an improved strain of wilt resistant seed which will be available as green tag seed in 1954, gave an increase of 699 pounds of seed cotton per acre above the average yield of adjacent rows of the green tag seed in one test conducted last year.



W. J. EITEL was appointed assistant entomologist on the Texas Extension Service staff Feb. 1. Eitel has been employed since August, 1952 by a commerceial concern. His appointment was announced by The Cotton Gin and Oil Mill Press Feb. 14.

Keep Fields Bug-Free in '53

Expanded Research Program On the Pink Bollworm

"Research is not magic. Research means hard work over many years in exploring all possible lines of attack. This accelerated research program will not yield a panacea, but existing weapons will be improved and new ones developed to combat this dangerous enemy and check its eastward spread."

By K. P. EWING

K. P. EWING, now Head of BEPQ's Division of Insects Affecting Cotton and Other Fiber Plants, USDA, was in charge of BEPQ's expanded pink bollworm research program when this paper was read at the Sixth Annual Cotton Insect Control Conference, Memphis, Dec. 10-11, 1952.

AT THE Cotton Insect Control Conference held in this auditorium about a year ago, Dr. C. R. Sayre, then chairman of the Beltwide Pink Bollworm Committee, delivered a comprehensive and highly enlightening address on the subject, "Review of Current Pink Bollworm Research and Control and a Suggested Plan of Action." He surprised many leaders of the cotton industry by informing them of the millions of dollars being spent annually by State and Federal Agencies, farmers, ginners, oil millers, and others in trying to control, suppress, or prevent the spread of the pink bollworm, in comparison with the meager amount being spent for research to find better methods of control. Perhaps his most pointed and awakening statement was, "Again, without being critical in the negative sense, it would appear that things are rather unbalanced due to our year after year spending as much money for control based primarily upon judgment and trial and error experiences without having well developed, highly intensified basic research programs." A plan of action was then proposed.

Needless to say, after Dr. Sayre's candid and constructive suggestions many people began to think of expanding research on the pink bollworm. Some people did more than merely think—they put their thoughts on paper and into action. Three pink bollworm committee meetings were held in Memphis — on March 17, June 26-27, and July 14-15, 1952. The committee consisted of representatives of the Bureau of Entomology and plant quarantine, entomologist and quarantine officials from various states, representatives of the National Cotton Council of America, and representatives of other agricultural agencies vitally interested in cotton.

Out of these meetings evolved a comprehensive group of research projects. Some old-line projects were to be continued and expanded and some entirely new lines of investigation were to be undertaken.

I was unexpectedly brought into the picture during the latter part of July to assist in putting the program into action.

With the limited funds now available to take care of only the most urgent needs, it is difficult to determine whether the immediate research should be determined more by needs from a geographical standpoint or from the standpoint of long-range results. Research is not magic. Research means hard work over many years in exploring all possible lines of attack. This accelerated research program will not yield a panacea, but existing weapons will be improved and new ones developed to combat this dangerous enemy and check its eastward spread.

Research on the pink bollworm is not new. It has been carried on by our Bureau and other Federal, as well as State and private agencies in this country and Mexico continuously for the last 35 years. Most of this research, however, has been conducted along the Rio Grande River in Texas or in Mexico where climatic and other conditions make the results of certain phases of the investigations inapplicable to most of the infested areas of this country. I should like to emphasize the fact that in July 1952, when I became directly associated with the pink bollworm research program, research had been expanded considerably over that of the last year. Several workers from other cotton-insect laboratories such as those at Tallulah, La., Stoneville, Miss., and at Tucson, Ariz. had been transferred to Brownsville and College Station, Texas to work on the pink bollworm; some of the personnel at our College Station laboratory who were working on other cotton insects were transferred to pink bollworm investigations; five additional research workers have been recently employed to do pink bollworm research. The number of scientific personnel now employed on pink bollworm research has more than doubled during the last 12 months, and further increases are anticipated as soon as additional funds and adequate working facilities become available. Thirty research projects have been proposed for study, but I shall only discuss here the highlights of some of the most important ones.

I should like to mention first several new lines of research that have been initiated within the last 12 months.

• **Nutritional Studies** — For the first time the pink bollworm has been reared from egg to adult on a purely synthetic medium, in which all components are known and are chemically pure. This medium is composed of dried egg albumin, dextrose, cottonseed oil, and crystalline vitamins. Physical conditions necessary for the development of the insect have been determined. No one knows how important this additional knowledge may be.

Why can the pink bollworm survive on no other plant than cotton or some member of the cotton family? There must be some relationship between the nutritional requirements of the insect and the fact that only this one family of plants can satisfy those requirements. We intend to find out what the relationship is and, if possible capitalize on this supposed weak link in its armor. This may be accomplished through plant breeding —breeding out of the plant the particular nutritional quality that is essential to the normal development of the insect; or it might be accomplished by the reverse procedure—breeding into the plant some quality that would be physically or nutritionally detrimental to the insect. Perhaps when we know more about the nutritional requirements and what enzymes and other metabolites are concerned in the normal metabolism of the pink bollworm, we can use some antimetabolite or growth-factor analog in its control. Although this line of basic research has just been started, it looks promising, and we hope that it can be greatly expended in a very short time.

• **Light Traps**—Another new line of research, conducted in cooperation with the Bureau of Plant Industry, Soils, and Agricultural Engineering and the Texas Agricultural Experiment Station, is the use of light traps. Although pink bollworm moths are reported to have been attracted to lights in Egypt many years ago, it was not until experiments with new types of lights were conducted during the past spring and summer in the Lower Rio Grande Valley of Texas that large numbers of moths were attracted and a light trap was looked upon as a possible valuable tool. Two types of lights were used — mercury-vapor and black-light lamps—both with a special light source bordering on the invisible spectrum. More than 295,000 moths were caught in 6 months in 8 traps operated

in the Lower Valley—a single night's collection in one trap exceeding 23,000 moths (July 27).

Following the high catch of moths in the Lower Valley, additional mercury-vapor traps were installed as follows:

Texas: Corpus Christi (4 traps), College Station (2 traps), Waco (1 trap), northern Texas (2 traps in each of 3 uninfested counties), Lamesa (1 trap).

Louisiana: Shreveport (2 traps), Natchitoches (2 traps), Tallulah (1 trap).

Mississippi: Stoneville (1 trap).

In addition one black-light trap was installed at College Station, Texas.

Through the use of the traps new infestations were found in two previously uninfested counties, Lamar and Fannin, in northern Texas. No other specimen of the pink bollworm except that caught in the light trap has yet been found in Lamar County. Thus the light trap has already proved to be a useful tool, and may become increasingly valuable and more economical than detecting the pink bollworm in new or lightly infested territory by the present method of gin-trash and field insepections. No moths were caught in the traps in Louisiana and Mississippi.

A trap that can be easily transported from field to field or from county to county and that will contain its own source of power is being designed for construction and operation next year. Laboratory tests will soon be under way to determine the specific region in the light spectrum that is most effective in attracting the moths. A trap of improved design may be available for use next year. Expanded experimentation with light traps is planned for next season to determine their value from a practical standpoint in (1) reducing infestations, (2) migration studies, (3) locating new infestations, (4) timing insecticide applications, and (5) determining the intensity of infestation from field to field and from year to year.

• **Hibernation Experiments** — Probably the greatest expansion of a single large project was that of the hibernation experiments. For the first time entire series of hibernation cages have been installed outside the heavily infested territory. These cages contain infested material installed to simulate field conditions—that is above the ground, on the surface of the ground, and beneath the surface. A series of 60 hibernation cages has been installed at each of the following new locations: In Texas at Port Lavaca (upper coastal area), Waco, (central), Greenville (northeast), Vernon (northwest), Lubbock (high plains). In Oklahoma at Chickasha (southwestern).

These experiments should furnish much needed information concerning the ability of the pink bollworm to survive the winter in Texas and Oklahoma under varied climatic conditions.

• **Dielectric Treatment of Cotton Seed**—In cooperation with the Bureau of Plant Industry, Soils and Agricultural Engineering and the Texas Agricultural Experiment Station, preliminary experiments were conducted in the Lower Valley to determine whether dielectric or radio-frequency treatment of infested cottonseed would kill the pink bollworm. A more satisfactory and economical method of sterilizing cottonseed than by the heat treatments now employed is needed. The ideal solution to the problem would be a cheap and quick method of sterilizing the seed cotton just before it enters the gin stands. The dielectric treatment killed pink bollworms in the

seed under certain conditions. The kill was high during long exposures. Although the exploratory work was not so encouraging from an immediate practical standpoint, this phase of research will probably be continued later when personnel and facilities are adequate.

• **Insecticides**—Some people think that farmers in certain areas of the Cotton Belt are going to have to live with the pink bollworm. One of the major fields of investigation should and will be to develop more effective and less expensive insecticides to control damaging field infestations.

In general farmers in the Lower Rio Grande Valley are of the opinion that, although the pink bollworm can be partially controlled with insecticides, their use, which often costs them from $50 to $60 per acre, is too expensive where average yields are around one bale or less per acre.

Various new insecticides and combinations of insecticides were tested in heavily infested fields of southern Texas during 1952. Heavy dosages of DDT continue to give the best control. When EPN or endrin was mixed with DDT, better control was obtained than when DDT was used alone at the same dosage. Increased yields of seed cotton resulting from the use of heavy dosages of insecticides ranged from a few hundred pounds to over one thousand pounds per acre.

Systemic insecticides will be discussed this afternoon by Dr. Ivy of our College Station laboratory, so I will only make a passing remark here. Although nothing practical has yet come out of this field of investigation, it holds tremendous possibilities, and plans are being made to expand all possible phases of research with systemic insecticides for the control of the pink bollworm, including studies of how the cotton plant reacts to these insecticides.

• **Stalk Destruction**—In some areas, especially in southern Texas, proper stalk destruction is very important in reducing populations of both the pink bollworm and the boll weevil. For the last several years experimental data have shown that shredder-type stalk-destruction machines killed more pink bollworms than roller-type cutters. During the latter part of the 1952 season it was found that, when plowing was delayed 5 to 7 days after stalks had been shredded and while the soil-surface temperatures ranged from 140° to 150° F., a high percentage of the pink bollworms in the bolls and locks were killed. One sample, which contained 720 live pink bollworms, showed a mortality of 99.6 percent after being exposed for one week under these conditions.

Another interesting and important finding was that there were more live pink bollworms when the bolls and locks were above or slightly below the ground than when they rested on the ground. One lot of stalks, cut by hand with a machete, placed in windrows, and sampled approximately one week after exposure, had a high survival; a 2-pound sample of bolls contained 182 live pink bollworms. This illustrates the protection afforded the larvae when the bolls and locks do not come in contact with the high temperature of the soil.

Hibernation experiments with thousands of pink bollworms over a period of several years have shown that approximately 60 percent of the survival as indicated by moth emergence occurred in a treatment in which infested bolls and locks were buried at a depth of 2 inches, 30-percent survival occurred in bolls and locks buried at a depth of 4 inches, and only 10-percent survival occurred in bolls and locks buried at a depth of 6 inches.

These findings emphasize the need for a greatly expanded research program to cover the entire subject of stalk destruction and burial of field debris. Perhaps stalk-destruction machinery could be improved to include a device that would kill bollworms at the same time. Studies should be made in various infested areas of the effect of soil temperatures and other factors on live pink bollworms in bolls and locks at the time stalks are destroyed. Attention should be given to the development of equipment for the proper burial of field debris to reduce hibernating larvae.

• **Defoliants and Herbicides**—There is a great need for a chemical that will permanently stop the growth or regrowth of the cotton plant. This would insure no further feeding or breeding of the pink bollworm or the boll weevil. Under certain conditions such treatment might be a satisfactory substitute for mechanical stalk destruction. In 1952 at Brownsville, 55 chemical formulations were tested to determine their efectiveness in defoliating or preventing the regrowth and fruiting of cotton plants. None of them proved to be entirely effective under all conditions but the most effective under a wide range of conditions was 4-percent pentachlorophenol in Diesel oil. This promising and important field of investigation will be greatly expanded as additional personnel become available.

• **Alternate Host Plants** — During the last two years pink bollworms have been hibernating in the upper coastal area of Texas in two new wild malvaceous hosts, **Hibiscus militaris** and **H. lasiocarpus.** Heavily infested bolls of **H. lasiocarpus** were found in the same area in November 1952. These plants also occur in low marshes along the Gulf coast from Texas to the Atlantic seaboard.

Alternate host plants of the pink bollworm and their importance in its perpetuation and spread should be studied in various infested areas and also along the entire Gulf coast. Plans are now underway to expand this project.

• **Natural Enemies**—During the last few months native parasites and predators of the pink bollworm have ben investigated in the Brownsville area. One experienced man has been assigned to this project and two or more others will be assigned to these and other similar studies next season. This project will shortly be expanded to include the introduction, rearing, and attempted colonization of foreign species.

• **Physiological, Morphological, and Histological Studies**—An insect physiologist was employed last September to work at Brownsville. When additional funds and suitable laboratory facilities become available it is planned to employ other technical men to do work in this field and to make studies of the morphology and histology of the pink bollworm as an aid to the physiological investigations.

• **Climatic Cabinets**—Cotton leaders of several states that are still free of the pink bollworm have expressed a desire to learn whether this insect can survive the winters and climatic conditions in their states. However, they do not want live pink bollworms carried into their states for hibernation or other life-history studies.

It is possible to obtain such information through climatic-cabinet studies conducted at some point in a heavily infested area such as Brownsville, Texas. These cabinets can be made to simulate climatic conditions at any desired location, such as Stoneville, Miss., Bakersfield, Calif., or Florence, S. C. The equipment for these cabinets and their construction and operation are expensive. Funds at present are not available for such studies. Interested states could expedite the answer to this and similar questions concerning the pink bollworm in their areas by furnishing financial cooperation.

• **Other Projects**—A few of the other projects that will be started or expanded as soon as funds, personnel, and laboratory or field facilities become available are as follows:

(1) Chemical control of overwintering larvae in crop debris and soil.

(2) Search for and utilization of native or foreign bacterial, fungus, virus, or other diseases of the pink bollworm.

(3) Improvement of methods of destroying pink bollworms in cottonseed and seed cotton by heat, fumigants, etc.

(4) A study, under natural field conditions in various infested areas, of temperatures, soil moisture, rainfall, humidity, soil types, plowing, irrigation, pasturing, and other factors on winter survival in the soil, in crop residues, in gin trash, and in other hibernation quarters.

(5) Detailed studies throughout the season of the life history and habits of the pink bollworm in areas where such studies have not been made.

• **New Laboratory** — New headquarters in a heavily infested area will be provided for the expanded research on the pink bollworm. Brownsville, Texas has been selected as the most advantageous location. Negotiations have been in progress for some time, and it is believed that through the cooperation of Texas Southmost College adequate quarters will soon be obtained on the Old Fort Brown property. If the present plans materialize, adequate office and laboratory space, warehouse, automobile storage, greenhouse, insectory, caged cultivated acreage, open field cultivated acreage, irrigation, and other facilities will be available probably by April or May 1953. It is planned to continue portions of the research work at College Station and Weslaco. Centers for limited field investigations will probably be established at Port Lavaca, Waco, Greenville, Vernon and Lubbock, Texas, Chickasha, Okla., and other points.

• **Coordination of the Research** — Research on the pink bollworm should not and cannot be entirely separated from research on other cotton insects. Certain

Quotes From Our Authors:

"ALTHOUGH the field of systemic insecticides looks like a very promising one, we should certainly try to correct the impression that the 'systemic era' is at hand, and that the panacea for all our problems is just around the corner."—E. E. IVY.

phases of the research and the application of its results are so interrelated that they must be coordinated and the work directed toward the development of a program to control all the cotton insects that occur in areas infested with the pink bollworm.

• **Cooperation**—Many people, agencies, and organizations have contributed greatly to the pink bollworm research program during the past year. Without the interest, cooperation, and hard work of the many cooperators, the expansion and progress that has been made would have been impossible. We are indebted to all the cooperators, and especially to many representatives of the Texas Agricultural Experiment Station; the Bureau of Plant Industry, Soils, and Agricultural Engineering of the U.S. Department of Agriculture; and the National Cotton Council of America. Acknowledgment is also made of the financial assistance provided by the Oscar Johnston Cotton Foundation. With the continued assistance of all present cooperators and with additional help from other sources, we are confident that even more rapid progress will be made within the next year to bring about a more practical control program in the not too far distant future.

W. O. Fortenberry Placed On Council Committee

The appointment of W. O. Fortenberry, Lubbock, Texas, as a member of the advisory committee of the National Cotton Council has been announced. He also is a member of the Council's foreign

W. O. FORTENBERRY

trade committee. The Cotton Gin and Oil Mill Press congratulates the Council on continuing to make use of the seasoned judgment of this respected leader who has made so many contributions to the ginning industry and the cotton industry as a whole.

Fortenberry, who sold his gin at New Deal, near Lubbock, last fall, has served as president of the National, Texas and Plains ginners associations, a director of the Council and on many special committees of the industry.

• International Paper Co. is giving away 2,500,000 pine seedlings for planting in Arkansas and Oklahoma.

As Viewed from The "PRESS" Box

• Can We Win the Insect Fight?

INFORMATION in this Sixth Annual Cotton Insect Control Issue is based on nearly 60 years of research by USDA and the states, half a century of Extension Service activities that began because of the boll weevil, and work by many other public and private agencies. During these years, especially the last decade, notable progress has been made in the control of cotton pests, as articles in this issue clearly show.

However, the spread of the pink bollworm and the ever present threat from other cotton insects may cause some to wonder, "Can we win?"

An encouraging answer—"I give an unqualified yes to the question, 'Can insects be eradicated?'"—comes from Dr. Clay Lyle, director of Mississippi's Experiment Station and Extension Service and dean of the School of Agriculture, in a chapter in the USDA's 1952 Yearbook of Agriculture.

"It is possible to wipe out destructive insects and it is desirable to do so," Dr. Lyle says, but adds, "No eradication project can succeed, no matter how effective the controls devised by the entomologist, without the full cooperation of farmers in initiating and supporting the necessary enforcement laws and regulations and in carrying out the recommendations."

Farmers, and ginners, crushers and other segments of the cotton industry, share fully in the responsibility of aiding the objectives of this Insect Control Issue. No cotton grower, ginner or crusher can afford the cost of unrestricted insect damage. The cotton industry can afford it even less in periods when prices and markets are uncertain than when times are better. All of us owe it to our industry to support the theme of this issue: "Keep Fields Bug-Free in '53."

• It's Wise to Be Early

IT'S WISE to be early in securing insecticide supplies again this season, even though raw materials and production facilities appear to be adequate to meet normal minimum needs. Mike Swoboda, New Mexico Extension entomologist, points out that problems could arise if there is a sudden rush to buy any particular item. He suggests that farmers order their minimum needs well in advance of the growing season.

• Loan 30.80 Cents

USDA has announced that it will support the 1953 cotton crop at a minimum of 30.80 cents per pound for middling ⅞ inch cotton. This minimum loan rate is 90 percent of the Jan. 15 parity of 34.22 cents. The final loan rate will be based on parity next July 15, and if it is higher than the minimum that has been announced farmers will get the higher loan rate. USDA also has announced that minimum prices supports will be 73.92 cents for extra long staple cotton, with American-Egyptian having a minimum of 74.52 and Sealand and Sea Island 56.22 cents.

• No Cut in Delta Soybeans

NO REDUCTION in soybean acreage is expected in Delta counties of Mississippi this season, and a sizeable acreage will be found in every Delta county, according to L. H. Moseley, Extension district agent. County planning committees feel that the Delta needs the equivalent of the 325,000 to 340,000 acres planted to soybeans in 1952 to keep the land use pattern balanced, fully utilizing available equipment.

• Dairy Critic Ousted

JAMES J. HAGGERTY has been dismissed as director of the USDA's office of foreign agricultural relations. In a speech last November at St. Paul, Minn., Haggerty sharply criticized restrictions on imports of butter and dairy products and the activities of organized dairy interests.

• Pre-Planting Pays Best

DON JONES, superintendent of the Lubbock, Texas, Experiment Substation, recently told Bailey County farmers that one pre-planting irrigation, properly applied, will do more good than all the other irrigation combined.

• Goods Better Be Good

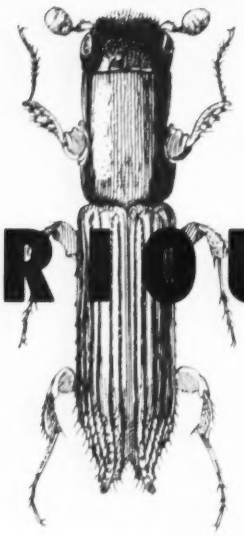
COTTON GOODS have to be good in Russia, or the factory that makes them is fined. The Soviets are trying to improve the quality of cotton textiles through a system of strict control, inspection and fines for failure to meet the standards set by the government. Factories of the Moscow, Kalinin and Vladimir regions paid more than nine million rubles in fines during 1952 for defective cotton materials.

• $37 Million for Repairs

REPAIRS on machinery used by Texas farmers are estimated to have cost $37 million in 1952, says W. L. Ulich, Extension agricultural engineer. About 270,000 tractors and more than 2½ million farm implements as attachments to tractors are in use in the state. Through district, county and community tractor maintenance clinics, the Extension Service is working to improve the usefulness and efficiency of the equipment.

• Do You Believe It?

ERRONEOUS BELIEFS that date as far back as the Middle Ages are still found among farmers and livestock raisers, the American Foundation for Animal Health reports. Among the superstitions found by veterinarians is a belief in a disease that never existed —"hollow tail" or "hollow horn" of cattle. Treatments that are encountered include such things as the use of chewing tobacco and kerosene for tetanus; forcing an old sock, smeared with grease, down a cow's throat to cure indigestion; and placing a board on a horse's head and pounding it with a hammer as a treatment for sleeping sickness.



In the skies and on the earth below, man is surrounded by billions of

CURIOUS CREATURES

STRANGER than the wildest creations of science fiction writers are the realities of the insect world, including those that live in pools of petroleum, some that lay self-multiplying eggs, and the eaters of cigarettes, mustard plasters and poisons.

SURROUNDING MANKIND is a strange world. Its inhabitants fill the skies above us, the surface and the bowels of the earth with curious creatures. Among its citizens are many who benefit the human race, as well as others who bring death and destruction to people and their property. This is the world of insects, with a population so large that no man knows the total—or even the total number of different species.

Pests that prey on cotton are all too familiar to most of the readers of this Sixth Annual Cotton Insect Control Issue of The Cotton Gin and Oil Mill Press. Less familiar are the billions of other insects, among which are the oddities discussed in this article.

Stranger than the wildest denizens of other planets dreamed up by the science fiction writers are the realities that populate the insect world. Pygmies, giants and freaks demonstrate the versatility of nature in adapting its creations to the vagaries of this globe which we share with the six-legged inhabitants.

"Oddities of the Insect World" is the title of an interesting article in the 1952 Yearbook of Agriculture published by USDA. From this article, and others in this fascinating volume devoted to insects, we have obtained most of the following information about a few of the many curosities among the insects.

• **Color and Perfume**—Color for camouflage or attraction is a familiar phenomenon of the insects. The walking-sticks, twig-like insects that are fairly common in the southern portion of the U.S., have giant cousins in the East Indies that are 15 inches long and have been known to feign death for six hours at a time. Dead-leaf butterflies in India show many color variations, depending on the types of leaves they frequent, and some of these butterflies have patches and dots closely resembling fungi which discolor the leaves.

Odors are used by insects both to attract and repel. The fragrance of the tropical tiger beetle is similar to attar of roses and serves as a lure for small nectar gatherers on which the beetle feeds. In contrast are such insects as the familiar stink bug and the lacewing—skunks of the insect world.

• **They Never See Land** — Amazing adaptations to their environment are found among insects all over the globe. On the seas, water striders live on the waves many miles from the shore. Their eggs are laid on the floating feathers of seabirds and the insects never view the land.

One insect is able to live in the mud of hot springs where the water reaches 120 F.; and at the other extreme is the alpine rock crawler which lives at elevations of a mile or more above sea level, and prefers temperatures of about 38 F., sufering heat prostration when the mercury rises to 80. There also are larvae which spend the early part of their lives living in pools of petroleum, flies that breed in the brine of the Great Salt Lake and blind insects residing deep in caves.

• **They'll Eat Anything** — The average person pays little attention to the eating habits of insects unless their diet happens to include his own flesh, his livestock, crops or other property. Entomologists, however, report many curious materials among the things on which insects feed.

The drug-store beetle has been called the goat of the insect world because it is known to feed on 41 different substances, including the poisons aconite and belladonna.

Other beetles, says the Yearbook of Agriculture, "feed on cigarettes, mustard plasters, and red pepper."

Moths that feed on feathers, the honeydew that is the "national dish" of ants, and the cellulose digested by minute organisms in the intestines of termites also should be mentioned.

• **Strange Ways of Living**—The bubbles so often found on ponds in the U.S. represent a form of insect airconditioning. The froghopper makes its own climate with them. Overlapping plates beneath its abdomen permit it to pump and expel air, producing bubbles from sap which the insect has sucked from a plant. Within the bubbles live the immature of the species, sheltered from the sun and kept moist.

The rat-tailed maggot is another insect found over much of the U.S. Living in stagnant water, it feeds on the bottom and breathes through a tube that forms its tail.

Man is the ultimate victim of the living habits of the human bot fly, but only by a most circuitous route. Mamma bot fly makes no effort to find a human when she's ready to lay her eggs. She finds a mosquito and lays her eggs on its underside. The mosquito seeks out the human being, and the eggs hatch while the mosquito is sucking the blood. Thus, although the mother never sees us, we humans provide an incubator for the eggs and skin into which the larvae burrow after hatching.

Some grubs that bore into wood for their housing have their growth retarded by a reduced diet and live for years in timber or furniture. In one case an adult beetle came from a porch post that had been standing for 20 years; and the periodical cicada spends more than 15 years in the soil before it emerges for a short life as an adult.

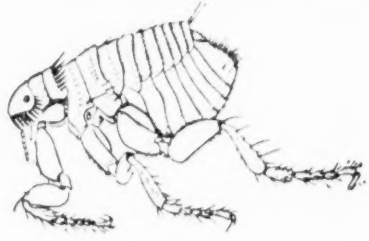
• **Love Life and Birth**—Insect relationships with their mates and their young are among their stranger habits. Writers of ghost stories frequently mention the death-watch beetle which bumps its head on the top of the tunnel of wood in which it lives in order to send a message to its mate. Some flies use frothy bubbles to attract the attention of females of the species.

A small fly found in England produces small larvae which tear open the body of their parent in order to escape at birth. Their own offspring, of course, use the same process at birth.

Self-multiplying eggs are laid by some flies. More than 2,000 larvae have been produced from a single chalcidfly egg. Many insects have the faculty of laying a tremendous number of eggs. One example is a tropical termite which may produce as many as 10,000,000 eggs from its swollen body. Authorities say that some termite queens lay 6,000 to 7,000 eggs daily and live for 15 to 50 years.

Fortunately for mankind, the death rate is high among the insect young. Aphids produce many generations each season, and someone has figured out that, if they all lived, the descendants of one female aphid would total 1,560,000,000,000,000,000,000,000,000 by the end of the season.

• **Even the Usual Is Strange**—As pointed out in the Yearbook of Agriculture,



even the commonplace habits of familiar insects are strange. More than a century ago two pioneer entomologists, William Kirby and William Spence, wrote, in describing a moth:

"Were a naturalist to announce to the world the discovery of an animal which first existed in the form of a serpent; which then penetrated into the earth, and weaving a shroud of pure silk of the finest texture, contracted itself within this covering into a body without external mouth or limbs, and resembling more than anything else an Egyptian mummy; and which, lastly after remaining in this state without food and without motion . . .should at the end of that period burst its silken cerements, struggle through its earthly covering and start into day a winged bird—what would be the sensation excited by this strange piece of intelligence?"

Expects Shift to Alfalfa In San Joaquin Valley

A large shift from cotton to alfalfa in the San Joaquin Valley of California this season was forecast by Watt Keister, manager, Germain Seed Co., Fresno, at a recent meeting of the Fresno county chamber of commerce agricultural committee. He added that the trend to alfalfa will be heavier among growers leasing land.

Dr. J. P. Benson, Five Points cotton grower, expressed the belief that the recently depressed cotton situation has taken a turn for the better. He cited the increased interest in American cotton for export, renewed mill activity and the strong possibility that domestic consumption will increase this season.

At Annual Convention

Oklahoma Ginners Elect Rosenbum

■ PROFITS from growing cotton in state stressed by speakers on panels. Association to continue public relations program.

Members of the Oklahoma Cotton Ginners Association elected W. E. Rosenbum, Hugo, president, and adopted resolutions supporting public relations, educational and legislative activities aiding cotton and agriculture at their annual meeting, March 3-4, in Oklahoma City. Elmer Dawson, Mountain View, was elected first vice-president; M. N. Panell, Lawton, second vice-president; and J. D. Fleming, Oklahoma City, secretary-treasurer.

Directors re-elected were D. D. McClain, Elk City; Afton Bailey, Hollis; Doyle Jameson, Davidson; Sam LaFaver, Watonga; Arthur Opitz, Binger; M. N Panell, Lawton; G. E. Sipe, Yale; E. J. Mitchell, Wynnewood; L. A. Palmer, Okemah; Virgil Jumper, Idabel; G. N. Irish, Muskogee; and Leo Bey, Coalgate.

E. L. Williams, Granite, outgoing president, addressed the group March 3, and Clifton Kirkpatrick, field representative, National Cotton Council, Memphis, spoke on "Cotton and the Council." Two panel discussions, "Should I Grow Cotton in Western Oklahoma" and "More and Better Cotton Products at Lower Prices," were presented March 3. J. D. Fleming led the first discussion with Dr. Peter Nelson, K. C. Davis, Raymond B. Marshall and Leo V. Blakely, all Oklahoma A. & M. College faculty members, serving as panel members. E. D. Hunter, assistant director, Oklahoma Extension Service, led the other panel. Members were Dale McClain, Elk City cotton farmer; Francis L. Gerdes, in charge, USDA Field Laboratory, Stoneville, Miss.; H. B. Dowell, president, Commander Mills, Sand Springs; and A. Mason DuPre', industrial analyst, Southern Regional Research Laboratory, New Orleans.

On March 4 Clyde A. Bower, entomologist, Oklahoma State Department of Agriculture, spoke on "Quarantine Regulations for Pink Bollworm." Wm. F. Lagrone, Oklahoma A. & M. economist, discussed "Cotton Production on the Prairies of Eastern Oklahoma." "The Extension Service Cotton Program for 1953" was explained by George Stroup, Extension cotton specialist, Oklahoma A. & M. College.

Crushers Named Directors For River District

Two Texas cotton oil mill managers, J. Howard Fox of Hearne and Raymond F. Holubec of Granger, have been appointed directors for the Brazos River Conservation and Reclamation District by Governor Allan Shivers. Fox is manager of the South Texas Cotton Oil Co. mill and vice-president of Texas Cottonseed Crushers' Association, and Holubec is manager of the Farmers Cottonseed Oil Mill and prominent in industry and civic activities.

At Memphis, March 23-24-25

Plans Ready for Midsouth Gin Exhibit, Conventions

■ EXPECT 3,500 ginners and representatives of allied industries to attend gin supply exhibit at Midsouth Fairgrounds and annual meetings of Arkansas-Missouri, Tennessee and National ginners' associations. Quality and efficiency will be theme of program and educational display.

MEMPHIS will be host March 23-24-25 to one of the nation's largest gatherings of cotton ginners and representatives of allied industries, with more than 3,500 attendance anticipated for the Second Annual Midsouth Gin Supply Exhibit and the annual conventions of the Arkansas-Missouri Cotton Ginners' Association, Tennessee Cotton Ginners' Association and National Cotton Ginners' Association.

W. Kemper Bruton, Blytheville, Ark., exhibit chairman, and executive vice-president of the Arkansas-Missouri and National associations, has announced that "Ginning for Quality and Industry Efficiency" will be the theme of the program and educational display. The Louisiana-Mississippi Cotton Ginners Association and Delta Councils of Louisiana and Mississippi have joined in urging gin owners and operators to see the exhibit and attend the sessions.

• **Many Exhibit Features**—Good and bad methods of harvesting will be shown, along with samples of unginned cotton which will emphasize grade differences due to harvesting methods, in the educational exhibits. A cutaway model will show how a modern gin operates. Samples of ginned cotton taken at various stages of ginning will show the purpose of each individual operation.

Two gins constructed by the USDA Cotton Ginning Laboratory at Stoneville, Miss., are expected to attract much attention. One will be a six-inch model of a saw gin, in actual operation. The other will be a complete miniature gin, built to scale, containing every piece of equipment. The layout will take up a space four by ten feet.

The cottonseed grading system, cottonseed by-products, packaging methods, classing, checking and testing procedures, all will be explained in the educational display. A spindle will be installed and will be seen in operation, spinning roving into yarn. Displays of finished textiles will include apparel cottons, draperies and awnings.

Gin manufacturers and suppliers will show a wide variety of products, ranging from fire extinguishers to scales. Booths have been reserved also by distributors of such products as planting seed, fertilizer, insecticides, lubricants, farm equipment, mechanical cotton pickers, diesel engines, electric motors, bagging and ties, irrigation equipment, steel buildings, and pneumatic equipment.

A new device for weighing cotton in the press box, bur burners, magnetic boll traps, tower driers, electrical equipment and controls, a one-man cotton sample wrapping table, and moisture control apparatus for gins, will be included in the equipment displays.

Latest methods of cotton ginning and the importance of ginning efficiency to the quality of cotton lint will be detailed in programs to be presented at the Casino Building, Fairgrounds, during the Exhibit. A panel on "Ginning for Quality" is scheduled Monday Morning, March 23. Tuesday morning, experts in the field will discuss "Ginning for Industry Efficiency," pointing out how good ginning is related to all the processes which follow in cotton manufacture.

• **Programs for Conventions**—Registration will begin 2 p. m. Sunday, March 22, at the Peabody Hotel for the conventions of the Arkansas-Missouri and Tennessee associations, and each association's board of directors will have meetings at the hotel at 3 p. m. Sunday.

Members of the associations will convene Monday at 9:30 a.m. in the Casino Building on the Fairgrounds for the first of the business sessions to be held Monday and Tuesday. Featured speakers, supplementing the panel discussions, will be Byron T. Shaw, Washington, administrator of the USDA's agricultural research administration; and Dr. Claudus T. Murchison, economist, American Cotton Manufacturers' Institute.

Memphis Cotton Exchange will be host for a style show luncheon Tuesday noon for ladies at the Skyway of the Peabody Hotel, and arrangements are being completed for an informal reception Monday at 4 p. m. for ladies, also to be held at the Peabody.

Each association will have a business session Monday night, and on Tuesday night members of the two associations will join with all ginners attending the exhibit for a hospitality hour and banquet.

The annual convention of the National Cotton Ginners' Association will be held at 2 p. m. March 25 at the Peabody.

Missouri Cotton Producers To Hear Hope, Symington

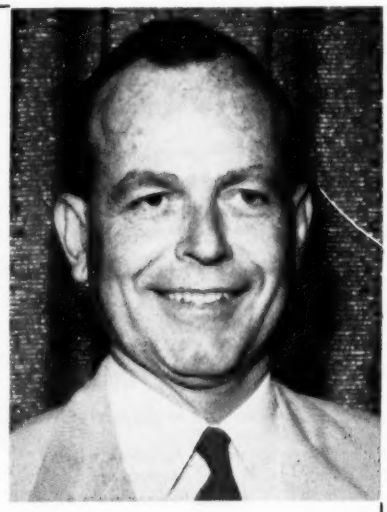
Congressman Clifford R. Hope, Chairman of the House Committee on Agriculture, will be the featured speaker at the fourth annual meeting of the Missouri Cotton Producers Association, which will be held at the Sikeston Armory March 18. In addition to Hope, Senator Stuart Symington and Congressman Paul Jones, both of Missouri, will address the meeting.

Hilton L. Bracey, executive vice-president of MCPA, announces that the meeting has been set up for morning, afternoon and evening sessions. The program will feature addresses by the visiting Congressmen and include educational exhibits, agricultural situation digest, cotton outlook, agricultural efficiency, program resolutions, and committee reports. President A. L. Story will give the annual report of activities and outline program objectives for 1953. There will be a banquet, and the day's activities will be climaxed by an area-wide cotton fashion show starring the Missouri Maid of Cotton.

The meeting will convene at 10:30 a. m. and all regular members, associate members, and friends of agriculture are invited and urged to attend.

Ginners, Crushers Have Vital Role

By W. B. COBERLY, Jr.
President, National Cottonseed Products Association



■ RECENT decades have brought great progress in cotton production efficiency. Yet, despite extraordinary developments in methods and materials for insect control, insect damage to cotton still takes a heavy toll in cost and loss, and is a major factor in limiting greater production efficiency.

This is so because much remains to be learned, but also because there is not always a good or sufficient understanding of the underlying interdependence of farmers in preventing and combating insect infestation. Here is a field where there is a need for both independent and cooperative action—the former to insure better materials and methods, and the latter to insure their most effective use.

Since the effectiveness of any insect control plan is usually dependent upon its widespread adoption, ginners and crushers have a natural and vital role in helping to stimulate greater interest in acceptance by growers of planned programs of cotton insect control.

Keep Fields Bug-Free in '53

Excerpts from

1952 Conference Report

on Cotton Insect Research and Control Memphis, December 7-9

The material in this report reflects today's thinking on the subject of cotton insect control and presents information of value to everyone who will have a part in the 1953 control program.

RESEARCH and extension entomologists and associated technical workers from 13 cotton-growing States (Alabama, Arizona, Arkansas, California Georgia, Illinois, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee and Texas), the United States Department of Agriculture, and the National Cotton Council of America participated in a conference at Peabody Hotel, Memphis, Tenn., on December 7-9, 1952, to formulate a guiding statement for cotton insect control recommendations in 1953 based upon the research and experience of 1952 and previous years. Each section and sentence in this report was carefully considered and unanimously approved by all members of the conference. Cultural methods and the use of insecticides for controlling cotton pests are considered in this report.

Cultural control practices cannot be too strongly emphasized. It should be recognized that control of cotton insects with insecticides is really supplemental to the adoption of good farm practices. Cultural control methods include such factors as early fall clean-up before frost where possible on farms infested with the boll weevil or pink bollworm, seed treatment, early planting, fertilization, use of proper cotton varieties, proper land use, and cultivation. Cultural measures used against cotton insects, depending upon the ones to be controlled, are influenced by climate, soil conditions, fertility, topography, and geographical location.

In addition to recommendations for the use of insecticides against cotton insects, this report presents information believed to be of value (1) to industry in planning production programs and (2) to state and federal workers who cooperate with cotton growers in testing insecticides still in an experimental stage. It contains some suggestions as to research needs in developing more effective cotton insect control programs. A general statement of plans is included, by which extension entomologists will aid in bringing to the attention of growers and all other interested groups the 1953 cotton insect control recommendations for each state. Control recommendations are general and are not specifically fitted to local needs. It is expected that each state, in preparing recommendations for cotton insect control for 1953, will adapt to its own conditions the information given in this summary.

Hazards and Precautions in the Use of Insecticides

Development of new synthetic organic insecticides provides more effective means of controlling insects, but numerous problems such as hazard to man, domestic animals, crops, fish, and beneficial wild life, have been intensified by the use of these new chemicals. Most insecticides are poisonous to animals and man; therefore, they should be used with appropriate precautions.

The factor of immediate toxicity of insecticides is of great importance to the user, livestock, beneficial insects, and plants. There is, in addition, the effect of chronic toxicity due to repeated exposures, of accumulations in soils, and of residues on treated plants and on adjacent crops caused by drift. Everyone concerned with insecticides and their use should be thoroughly familiar with these various hazards. Proper precautions should be taken when formulating, packaging, labeling, and applying these materials.

No organic phosphate or other highly toxic material should be applied by aircraft or custom sprayer in such manner that unprotected persons will be exposed to hazardous concentrations.

Packages of insecticides registered under state or federal regulatory acts carry labels showing approved uses, unusual hazards, and antidotes if materials are highly poisonous. Users are therefore urged to read the label and follow directions explicitly.

• **Precautions for the User**—In considering the hazards to man, it is necessary to distinguish between immediate hazards (acute toxicity) and the accumulative effects (chronic toxicity). Man can be poisoned by breathing most insecticides, by absorbing them through the skin, and by swallowing them.

Most solvents used in preparing solutions or emulsions are also poisonous. Some are inflammable. Research and experience indicate that the new chlorinated hydrocarbon insecticides are reasonably safe to man and higher animals at strengths normally applied for cotton insect control. However, in concentrated form, they may cause acute poisoning when they come in contact with the skin or are swallowed. Continued contact with or exposure to such materials may result in an injurious accumulation of the toxic ingredient in the body. Persons engaged in applying these insecticides should avoid unnecessary exposure to them. It is advisable to wear a respirator with suitable filter pads. Hands should be washed thoroughly before food is handled. After a dusting or spraying is completed, and at least once a day when handling or applying insecticides, it is advisable to bathe and change clothes.

Phosphorus compounds such as **parathion, methyl parathion, EPN, schradan, and Systox are extremely poisonous materials and must be handled with great care.** It is not practicable to give all precautionary measures here that should be taken when phosphorus compounds are used. Such information is available through basic manufacturers, State Experiment Stations, or the Bureau of Entomology and Plant Quarantine. All users should be thoroughly familiar with precautions and see that they are followed.

An important precaution to observe is the avoidance of breathing wettable powders, dusts, sprays, or vapors. When handling or applying parathion, use a respirator that has been passed by the U. S. Department of Agriculture. A mimeographed circular dated August 24, 1951, was issued by the Bureau of Entomology and Plant Quarantine under the title "Respiratory Devices for Protection Against Inhalation Hazards of Dusts, Mists, and Low Vapor Concentrations of Certain Insecticides."

Loading and mixing should always be done in the open. Impervious gloves should be worn if it becomes necessary to handle the materials, but it is best to avoid unnecessary contact with insecticide sprays as well as dusts. Emulsifiable concentrates and wettable powders are especially dangerous.

It is advisable to have on hand in the field a change of clothing, soap and water, and a small supply of 1/100-gr. atropine tablets for emergency use, as recommended by competent medical authorities. Quick action is essential in case any symptoms of poisoning appear. Regular users of the organic phosphates should have their blood cholinesterase checked periodically. Persons directing control operations should assume full responsibility for enforcement of adequate precautions and should have had medical advice as to the emergency use of atropine.

No insecticides should be spilled where they might contaminate water used by man or livestock.

Excess dusts or sprays, even in small quantities, should be deeply buried.

Empty containers in which insecticides have been packaged should be burned or otherwise destroyed as soon as empty. Insecticides should always be clearly identified by labels and stored where they are inaccessible to irresponsible persons or domestic animals.

Equipment used for applying weed killers should not be used for applying insecticides because of danger of crop injury.

• **Residues on Plants**—Spraying or dusting should be done under conditions and in a manner to avoid excessive drift to adjacent fields where animals are pastured or where food crops are being grown. Care in preventing drift is also

essential because certain varieties of plants and kinds of crops may be injured by some insecticides.

In developing and using systemic insecticides the possibility of residues remaining in cotton seed products should not be overlooked.

Cotton that has received late applications of DDT and certain other persistent insecticides should not be grazed by dairy cattle.

• **Residues in Soils**—The effect of insecticides on germination, the rate of growth, and the flavor of crops may be influenced by the type of insecticide, the formulation used, the type of soil, the kind of plant, and/or the concentrations of the residues in the soil.

Information so far indicates that there is no immediate hazard to the plant growth of any crops when amounts and concentrations recommended for the control of cotton insects are followed. Injury to several crops has been demonstrated by higher rates of application of some insecticides as soil treatments on certain soil types. Soil applications of benzene hexachloride, chlordane, toxaphene, and parathion may cause off-flavor of some crops. Cotton treated with foliage applications of benzene hexachloride often causes off-flavor in Irish potatoes when this crop is planted in rotation with cotton.

• **Safeguarding Beneficial Forms of Life**—Insecticides destroy beneficial as well as injurious insects. Some materials are highly toxic to fish and other forms of aquatic life. It is especially important to use minimum amounts where drift to ponds and streams is unavoidable. Every precaution should be taken to avoid the pollution of streams and farm ponds stocked with fish when excess spray or dust materials are being disposed of, or when equipment is being cleaned.

Quotes From Our Authors:

"THIS DEVELOPMENT (of our modern, early maturing, rapid fruiting cotton varieties) represents one of the most outstanding plant breeding achievements in history." — T. R. RICHMOND.

Timing of Insecticidal Applications

With presently available insecticides, successful control of cotton insects depends more on correct timing of applications than on any other factor. Consideration must be given to the over-all population of beneficial and harmful insects rather than to a single pest. The stage of growth and expected yield are important.

Most insecticides kill predatory and parasitic insects as well as pest insects. Since use of insecticides often appears to induce outbreaks of bollworms, aphids, and spider mites, it is essential that insecticides be applied only where and when needed.

It is generally recommended that suitable insecticides be applied to cotton in its maximum period of fruiting and maturing of the crop, if insect infestations threaten to reduce the yield, seriously affect quality, or delay maturity. Recommendations for insecticide treatments are similar throughout the Cotton Belt, but certain details vary from state to state, and often within the state.

It is also generally recommended that early season applications be made to control cutworms and grasshoppers when they seriously threaten to reduce a stand.

Recommendations for early season applications for thrips, boll weevils, fleahoppers, and plant bugs vary greatly from state to state. Variations in early season infestations of these insects as well as many other production factors made it undesirable to attempt to standardize recommendations for early season control.

Insecticides and Miticides

Data from laboratory and field tests presented at the Conference indicated that no particular insecticide gave results outstandingly superior to those of any other recommended insecticides or mixtures of materials when they were used at the dosage, time, and frequency recommended by official entomologists for a given area. These factors are most important in the effective use of insecticides for cotton insect control.

• **Aldrin**—Aldrin has been widely used for cotton insect control during the last 3 years. It will control the boll weevil, thrips, the cotton fleahopper, the tarnished plant bug, the rapid plant bug, grasshoppers, and newly hatched cotton leafworms in most cases. It will not control the bollworm, the pink bollworm, the yellow-striped armyworm, the garden webworm, certain species of cutworms, the cotton aphid, or spider mides. Aldrin may increase populations of spider mites, and mixtures of aldrin and DDT may increase those of aphids. For boll wee-

vils, aldrin should be applied at the rate of 0.25 to 0.75 pound per acre. In areas or at times when bollworms are a problem, DDT should be added in the proportion of one part of aldrin to two parts of DDT. It is effective as a dust or spray.

Aldrin is toxic by skin absorption, by inhalation, and by ingestion. It is recommended for use on cotton only where persons applying it are fully aware of the hazards and will follow the precautions prescribed by the manufacturers.

(See Hazards and Precautions in the Use of Insecticides.)

• **Aramite**—This material will effectively control all species of spider mites for 2 to 4 weeks or more when applied at the rate of 1 pound of technical material per acre in dusts. It is also effective as sprays when thorough coverage is obtained. It will control some species of mites at dosages as low as 1/3 pound per acre, but 2 or more applications may be required. Aramite is compatible with sulfur, but especial care should be used in formulations. Dusts should not be held in storage. Aramite has essentially no insecticidal activity.

• **BHC**—BHC will control the boll weevil, the lygus bugs (though less effective than DDT), the rapid plant bug, thrips, the stink bugs, the garden webworm, the fall armyworm, the cotton fleahopper, the cotton aphid, and grasshoppers. It will not control the bollworm, the pink bollworm, the yellow-striped armyworm, spider mites, some species of cutworms, and the salt-marsh caterpillar. It is effective as a dust or spray. It has given erratic results against the cotton leafworm.

Except for use in early season, BHC is usually formulated to contain DDT in the ratio of three parts of the gamma isomer to five parts of DDT in both dust and spray formulations for over-all cotton insect control. This mixture should be applied at the rate of 0.3 to 0.45 pound of the gamma isomer and 0.5 to 0.75 pound of DDT per acre. (Example: 10 to 15 pounds of benzene hexachloride-DDT dust containing 3 percent of the gamma isomer and 5 percent of DDT). Where spider mites are a problem, the dust formulations usually contain at least 40 percent of a good grade of dusting sulfur. Another popular dust formulation contains 2 percent of the gamma isomer of BHC and 10 percent of DDT. Sprays should be formulated to contain the same amounts of each active ingredient per acre as the dusts. It is very important that the emulsifiable concentrate containing BHC be properly formulated to prevent foliage or plant injury.

BHC causes an off-flavor to Irish potatoes and possibly to other crops. It is not advisable to use materials containing BHC in controlling cotton pests on soils which will be alternated with such crops. It is highly desirable to use BHC containing a high percentage of the gamma isomer in dust or spray formulations to be used on cotton.

BHC is toxic to warm-blooded animals. It may enter the body through absorption, inhalation, or ingestion. Proper precautions in its use should therefore be observed.

(See Hazards and Precautions in the Use of Insecticides, and Residues in Soils.)

• **Calcium Arsenate** — Calcium arsenate has an excellent dusting quality and is an economical and effective insecticide for control of the boll weevil and the cotton leafworm. It is used at the rate of 7 to 10 pounds per acre for their control. Against bollworms 12 to 15 pounds per acre will give fair control, if applications are properly timed. Generally it is used undiluted against the above-mentioned insects. It often causes an increase in aphid population when used without an aphidicide. Alternate applications of calcium arsenate and formulations containing an aphidicide have given excellent results in some areas.

Lime-free calcium arsenate is compatible with organic insecticides. In some areas when it is combined with 5 percent of DDT and 1 percent of parathion (see precautions under parathion) boll weevils, bollworms, cotton aphids, and spider mites are controlled. Lime-free calcium arsenate in combination with these materials should be applied at the rate of 10 to 12 pounds per acre.

Calcium arsenate is injurious to some crops, especially legumes and oats in certain light sandy soils. It should not be used for cotton insect control in fields where rice may be planted. Drifting of the dust may injure other crops. Precautions should be taken to avoid drift that might cause bee losses. Calcium arsenate is poisonous and should be handled carefully. Livestock should be kept out of dusted fields. Care should be taken to avoid drift onto pastures, especially when applications are made by airplane.

(See Hazards and Precautions in the Use of Insecticides.)

• **Chlordane**—Chlordane has been tested extensively and has been used on a lim-

(Continued on page 58)

Keep Fields Bug-Free in '53

Where Do We Stand on Cotton Insects?

"The entomologist, the plant breeder, the producer and distributor of insecticides must share with the farmer the responsibility of effectually stopping these (insect) enemies and saving that seventh bale."

By F. C. BISHOPP

F. C. BISHOPP is Assistant Chief, Bureau of Entomology and Plant Quarantine, USDA, Washington.

WHAT SHALL WE DO to save that seventh bale from the insects? Many will say use plenty of insecticides. But it isn't as simple as that. They must be the right kind of insecticides, properly formulated and correctly applied at the right time and in the required amount. Not only that, but insecticides should not be applied when not needed. Furthermore, when used they must be used safely.

These requirements look tough and when I as a farmer, look over the long list of basic materials and the longer list of formulations of these, it's no wonder I become confused. What can I do to get straightened out? First, do I need to use insecticides? That depends on where my farm is in the cotton-producing states. In the northern cotton states, there is less chance of insects being bad every year; in fact, the boll weevil is only occasionally a pest to be dealt with in Virginia, Tennessee, Missouri and northern Arkansas. I should know from past experience what the chances are of serious insect trouble and what pests are usually present in the area. That is not enough. I must be ready to determine at frequent intervals what the insect conditions are in each cotton field—keeping in mind that insects often become damaging in one field or even in one part of a field before they do in another.

There are several ways of doing this. Many farmers become familiar with approved methods of taking infestations and do this often and well. Some farmers are hiring trained scouts to check their fields regularly and others are contracting such work. When a given infestation becomes heavy enough to warrant control with an insecticide is sometimes difficult to decide. Experience is a big help in making a decision, and several factors must be considered—weather, condition of the crop, potential yield on land of that particular type.

In areas where early infestations of boll weevil, thrips and aphids occur, early season application on a community basis appears to be desirable and profitable. In areas where thrips and aphids are abundant, cotton is freed of these pests by such treatments, which enables the crop to get off to an early start. Knocking off the overwintered boll weevils permits the plants to hold the early squares and bolls to be set and matured before the weevils develop in numbers. Community action is especially desirable in this system. Uniform, rather early planting to one variety with early maturing tendency is also important. This is particularly true where pink bollworm and the bollworm must be dealt with.

There is an advantage also in the early application plan from the standpoint of insecticide availability and distribution since it makes necessary purchase of some of the season's insecticide requirements before the heavy midseason demand.

This early season treatment plan is no hit-and-miss job. It must be done right if it is to succeed. It usually involves three thorough applications at 7- to 10-day intervals and then complete stoppage. If the applications are continued too late, it is likely that serious bollworm trouble will follow. By discontinuing the applications, time is allowed for the natural enemies of the bollworm to build up and destroy the early crop of bollworms. The large number of boll weevils that entered hibernation last fall in many parts of the Cotton Belt together with the mild winter we are experiencing make it likely that there will be many weevils on the young cotton next spring.

In many instances mid-season or late-season applications are necessary. There is reason to believe, however, that these would be less necessary if large areas were uniformly covered in the early season treatments. It must be remembered that this early season plan is particularly applicable where cotton pests are very numerous in the spring.

Keep a watchful eye on each field of cotton. Advise with your state entomological authorities about control procedures and be ready to hit the pests, whether insects or mites, with the proper insecticides at the most strategic time.

The importance cannot be over emphasized of choosing varieties well adapted to local conditons, having land well prepared and adequately fertilized, making reasonably early and uniform plantings and keeping fields free of weeds and well cultivated. These cultural practices go along with the use of insecticides in getting profitable returns from the cotton crop.

Another thing that growers should look into early this spring is the condition of spraying and dusting equipment. It is just as important to have proper equipment and to keep it in good repair as it is to choose the right insecticide.

All insecticides are poisonous, some more, some less. The highly poisonous materials such as parathion, TEPP and EPN must be handled with extreme care. With these insecticides the greatest hazard is to the men who are loading the dusters or sprayers and actually putting the material on the cotton. There is danger too of people being poisoned by working in the treated field and coming in contact with the plants soon after application. Remember that these phosphorus compounds can be dangerous by swallowing them, by breathing them, or by absorbing them through the skin. Emptying the concentrated material into a plane or other equipment is especially dangerous. Men doing this should wear protective clothing, rubber gloves and suitable respirators. Clothes must be changed and a bath taken when an application job is finished.

The less poisonous insecticides must also be treated with respect. Avoid undue exposure to dusts or sprays, wash your hands before eating and do not wear heavily contaminated clothing. Consideration must also be given to hazards connected with insecticide drift. The excessive drift onto gardens, forage crops, or pastures where dairy animals are involved must be avoided.

The job of producing cotton profitably in the face of our numerous enemies keeps every one of us on our toes. We now have many weapons with which to fight these enemies, if we use them right. The entomologist, the plant breeder, the producer and distributor of pesticides must share with the farmer the responsibility of effectually stopping these enemies and saving that seventh bale.

Beetles Pollinated Earliest Plants

Insects have helped in the pollination of plants since the time that the first flowering plants appeared on this globe, fossil records indicate. USDA says that the first flowering plants found among fossils were related to the magnolias, which to this day depend on the visits of beetles for pollination. Beetles were among the most abundant insects at the time of the appearance of flowering plants, and were the first pollinators.

At Atlanta, March 1-2

Williams New Head Of Georgia Ginners

■ SWINT and Estes are vice-presidents. Business program featured talks and panel discussion of ginning problems.

The Georgia Cotton Ginners' Association, at its annual meeting in Atlanta March 1-2, elevated Vice-President Herbert A. Williams, Jr. of Sylvania to the presidency, succeeding E. J. Swint of Jonesboro. Swint is now the Association's first vice-president and W. J. Estes, Jr., of Haralson is second vice-president.

About 200 ginners and guests attended the meeting. Features of the business program were talks by W. "Tap" Bennett, director of agricultural development for the Central of Georgia Railway; Clifton Kirkpatrick, director of field service for the National Cotton Council; and W. Kemper Bruton, executive vice-president of the National Cotton Ginners' Association and executive secretary of the Arkansas-Missouri Ginners' Association.

Another feature of the business program was a panel discussion of cotton production and ginning problems. On the panel were E. C. Westbrook, Georgia Extension Service; J. C. Oglesbee, Jr., USDA Extension ginning specialist; Chas. A. Bennett, USDA cotton ginning laboratory, Stoneville, Miss.; and C. R. Jordan.

Leo Aikman of the Atlanta Constitution was toastmaster at the annual banquet March 1. Miss Christelle Taylor, Georgia Maid of Cotton, attended the banquet and had a part on the program.

Directors re-elected were I. M. Foy, Statesboro; F. G. Guerry, Montezuma; James C. Mann, Conyers; W. W. Brinson, Dublin; Sam Smith, Cartersville; Jack Willis, Ocilla; O. S. Garrison, Homer; H. H. Redwine, Fayetteville; and John H. Anderson, Macon, at-large. New directors are Edwin Shiver, Morven, succeeding S. G. Maddox, Blakely; Dick Chambers, Madison, succeeding J. T. Preston, Monroe; and P. W. Vaughn, Williamson, at-large, succeeding W. J. Estes, Jr., the new second vice-president of the Association.

• Council Publishes Recommendations

PESTS could damage the 1953 cotton crop seriously, says Claude L. Welch, Memphis, director of the National Cotton Council's production and marketing division, in announcing the Council's campaign to help alert cotton farmers to the need for a thorough insect control program this season.

The Council has compiled a summary of the state cotton insect control recommendations for 1953. (These are the recommendations in this issue of The Cotton Gin and Oil Mill Press.) The Council's summary booklet will be distributed to county agents, vocational agriculture teachers, entomologists, cotton specialists, makers and formulators of insecticides, and application equipment manufacturers.

• Supervised Control On 100,000 Acres

SOME 100,000 acres of field crops in California were under supervised insect control during the past year. This meant that a trained entomologist was hired to inspect fields regularly and to make recommendations as to insect pest control. The coming season will, in all probability, see a substantial increase in acreage under the program. Vern Burton, Bakersfield, Kern County Farm Advisor, reports that Kern County alone had approximately 18,000 acres under the program in 1952 and that this figure may well be doubled this year.

Burton points out that the University of California department of entomology and parasitology is cooperating with growers in this program.

One type of such supervised control is the temporary one. In this, a grower or group of growers hire a trained entomologist to check the fields for the summer months. A second type is that in which supervising entomologists are hired for the entire year by individual growers or a group of growers.

Advantages of supervised control include the assurance that a participating farmer has his field under regular supervision of qualified personnel. Control recommendations are tailored to the individual field and all phases of control are used and integrated. Chemical control is made more effective and economical through improved timing and the elimination of unnecessary treatments.

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THAT WILL WORK

FOR LESS THAN

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SEEDBURO HYTROL Portable Folding Conveyor

YOU NOW PAY $25–$200 A WEEK FOR THE WORK IT WILL DO!

Grain, Feed and Seed Men now save $1,000 - $10,000 each year with a Hytrol

"We are doing the same work with two men and the Hytrol that four or five men were doing before." says Duncan G. McFadyen, Upchurch, Inc., Raeford, N. C. (Estimated saving if he pays his workers $40 a week – $4,160.)

"With this unit two men can handle and stack more sacks of fertilizer faster and with less effort than six men formerly did." says A. J. Sharpe, Marked Tree Gin Company, Marked Tree, Ark. (Saving up to $8,320.)

"Our 16" Hytrol is saving 50% in labor costs." says B. A. Estes, Farmers Co-op. Grain Company, Blue Rapids, Kans.

"We find the Hytrol Conveyor a great labor saver. It enables one man to care for our seed cleaning and all the piling," says I. W. Cornell, Cornell Seed Ranch, Middleton, Ida.

"We can unload a carload of feed and stack it away in half the time it used to take us, with much less labor." says A. L. Anderson, Farmers Elev. Co., Sleepy Eye, Minn.

KEEPS HELP HAPPY AND HEALTHY

Harry Heist, A. & C. Feed Company, Cheyenne, Wyo. says. "One of our problems is to keep a good man from injuring his back on the 100 pound sacks. Our Hytrol is keeping our good men with us and we are no longer selling their health."

PROTECTS BAGS, CARTONS, BLOCK SALT

A feed dealer tells us the Hytrol unloads 40,000 pounds of block salt in 1½ hours, instead of 8 hours with less breakage. Other users say the Hytrol reduces breakage of bags and cartons. Saves losses, saves time.

INCREASES STORAGE CAPACITY 10-40%

Hytrol helps you stack higher and lets you use balconies and other hard-to-get-at waste space. S. S. Savage, Everett & Savage Seeds, Chester, S. C. says, "We are stacking 22 bags high with a 14' Hytrol, increasing our warehouse space by at least 30%."

No other conveyor has so many features to move your materials faster, at lower cost. Low loading end saves lifting. For greater elevation – rounded wooden cleats gently hold bag or carton from slipping. To fit every need elevate your Hytrol to angle you need, even when in use. Rolls where you need help on easy-rolling swiveled wheels. Reversible belt Direction lets you unload a truck and load it up again with a flick of the switch. **Prices $541-$917 for 10-22 ft. Lengths.**

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CARRY IT WHERE YOU NEED IT – Prop It Up Between Truck and Loft – Put It Horizontally Between Truck and Dock – Lay It Down on a Stairway or Floor – Plug In and Flick the Switch.

The FIRST REALLY PORTABLE CONVEYOR. Weighs less than two sacks of grain. Moves 100 pound bags or cartons up and down, in and out of box cars, trucks or storerooms, and between floors. Carry one on your truck with a handy extension cord to connect to any standard electric outlet.

PRICE COMPLETE WITH MOTOR:

13 ft.—$392.00; 15 ft.—$435.00; 17 ft.—$476.00

In Vicksburg, March 30-31

Louisiana-Mississippi Ginners to Meet

■ C. C. SMITH will keynote first session with discussion of outlook for cotton. Panel discussions and entertainment scheduled.

The Louisiana-Mississippi Cotton Ginners Association will convene in Vicksburg, Miss., for a two-day meeting March 30-31. The first session, which is scheduled for Monday at 1:30 p. m., will feature an address by C. C. Smith, vice-president, National Bank of Commerce, Memphis, who will speak on "The Future of Cotton in the Deep South," according to Gordon W. Marks, Association secretary. T. M. Waller, associate Extension agronomist, Mississippi State College, will discuss the 1952 five-acre cotton program.

A panel discussion, "Current Cotton Ginning Practices and Modifications," headed by Alfred M. Pendleton, Extension cotton ginning specialist, USDA, Dallas, will conclude Monday's business session. Panel members include Charles A. Bennett, principal agricultural engineer, Cotton Ginning Investigations, and Robert A. Montgomery, agricultural engineer, both of USDA Laboratories, Stoneville Miss.

On Tuesday morning a panel discussion relating to the pink bollworm program is slated, and Dan P. Logan, an Association director, will serve as moderator. Tentatively scheduled to take part in the discussion is R. W. White, USDA pink bollworm expert, San Antonio, Texas.

Dr. H. G. Johnston, entomologist, Production and Marketing Division, National Cotton Council, will describe the program being developed in that division. Dave L. Pearce, Louisiana commissioner of agriculture, will discuss the state's activities in keeping the pink bollworm out of Louisiana. The name of the initial speaker for the Tuesday program has not yet been disclosed, but he is to be a person from outside the industry.

Ladies attending the convention will be entertained with a luncheon in the Old Southern Tea Room with Mrs. Mary McCaa as hostess. Mrs. McCaa, according to Marks, is a favorite hostess of Duncan Hines, the American epicure. A tour of Vicksburg will follow the luncheon. Monday evening ginners and their wives will be entertained on the S. S. Sprague, the world's largest sternwheeler, on the Mississippi River. Feature of the evening's entertainment will be a performance by the Dixie Showboat Players.

District Cotton Meetings Are Held in Oklahoma

District cotton meetings for County Agents and ginners are taking place in Oklahoma. George E. Stroup, Extension cotton specialist in production and marketing, Oklahoma A. & M. College, states the following topics are covered at each meeting: outlook for cotton, varieties for 1953, fertilizers, weed control (rotary hoe and chemicals), insect control, defoliation and mechanical harvesting. In addition, plans are being made for 1953 cotton demonstrations, sites and growers are being selected and summaries of cotton demonstration work are being given. District Agents serve as chairmen for the meetings.

Meetings were held at Stillwater on March 9 and at Muskogee on March 10. Four other meetings are scheduled—Chickasha, District Court Room, March 24; McAlester, District Court Room, March 25; Durant, City Hall, March 26; and Hobart, Eugene Field School, March 27. The Hobart meeeting date was originally March 23. Each meeting is scheduled to start at 9:30 a. m. and adjourn at 3 p. m.

According to J. D. Fleming, secretary, Oklahoma Cotton Ginners' Association, no other district meetings are planned to deal with insect control this year.

Georgia Has Cotton Meets

Six district cotton meetings were held in Georgia in late February and early March. Georgia Cottonseed Crushers Association President W. P. Lanier, Atlanta, urged cooperation in the promotion of a "bigger and better" cotton contest for 1953. Secretary J. E. Moses reports that County Agents, cotton committee representatives, crushers and others interested in cotton attended. Meetings were held at Tifton, Americus, Swainsboro, Griffin, Athens and Cartersville.

Keep Fields Bug-Free in '53

The Use of Aircraft in Controlling Insects

"The use of aircraft for treating cotton may be limited by the size of fields and other factors, but even small, hemmed-in fields one day may be no deterrent. Helicopters can meet such problems."

By KENNETH MESSENGER

KENNETH MESSENGER is In Charge, Aircraft and Special Equipment Center, Bureau of Entomology and Plant Quarantine, USDA, Oklahoma City, Okla.

IN THE ANNUALLY RECURRENT offensive against destructive cotton insects, no part of our armament challenges the imagination as does the airplane. For thirty years an important vehicle for applying insecticides, its future value will be limited only by our capacity to understand its peculiar characteristics—its virtues and its limitations. Cotton growers were among the first to appreciate the airplane's agricultural potential. What, then, are the reasons that they have not taken full advantage of that potential?

Most aircraft operators know how to do **good** work. Many are conscientious. Some know what materials to apply and when to apply them. A few have excellent equipment and get uniform coverage. But the kernel of the whole aircraft pest-control situation lies in the fact that growers get the kind of work they want. Reasonably well informed on insects and insecticides, they are less inclined to learn the difference between sound and slipshod aircraft equipment, between well-planned and haphazard methods of application, and even between dependable and unscrupulous operators. When growers learn these things and demand good work, operators will equip themselves to comply, and the airplane will become almost as indispensable to the production of cotton as it now is to the protection of forests.

The discovery that insecticides may be applied in concentrated liquid form promises advantages that have not been widely appreciated. In certain areas almost all insecticides applied by aircraft are still in dust form. In other areas almost all are in liquid form. The reason usually given for the continued wide usage of dust is that many growers prefer it. Yet it is doubtful that a single properly conducted experiment during the last four years has shown sprays to be less effective than dusts. Certainly satisfactory equipment for releasing them from aircraft presents special problems, but they have some important advantages. They adhere better to foliage, their residual effect is more lasting, they are easier to handle, and they can be applied in windier weather. Popular opinion is that dusts cover a wider swath than sprays. However, investigations show that the effective swath of a spray plane is at least as great as that of a dust plane. The claim that sprays may not penetrate the crop so well as dusts, although true of coarse sprays, appears to lose all validity as a result of recent investigations. Reports from researchers in several states indicate that, in spraying with ground rigs, one nozzle traveling above each row of cotton gives as satisfactory control as additional nozzles placed down between the rows. Therefore, there no longer seems to be reason for concern over forcing insecticides deep into cotton plantings.

Several cotton-insect entomologists in the Bureau of Entomology and Plant Quarantine recently were asked for opinions of the relative value of sprays and dusts applied by aircraft and for a statement concerning the transition from dusts to sprays in the areas in which they work. Significant replies are quoted.

K. P. Ewing, of Texas, states: "Experiments have shown that effective control of cotton insects can be obtained with either spray or dust applications of insecticides from properly equipped aircraft if the applications are properly made. . .The application of insecticides as sprays is gaining in popularity. . . . The trend in the application of defoliants is toward the use of sprays. Manufacturers are developing materials for such applications, since weather conditions are extremely dry in most areas of our state during late summer and fall. There usually isn't enough moisture available at that time of the year for the effective application of dusts."

W. A. Stevenson makes the following observation: "In Arizona we consider the use of airplanes a 'must' in our cotton insect control. During the past several years a very high percentage of the cotton grown in this state received some insecticide treatments during the season, and approximately 90 percent or more of the insectides used are applied by airplanes. . .It has now been definitely demonstrated that our cotton insect pests can be controlled with liquid insecticides, and their use will continue to increase."

In contrast we find the following condition in one section of Louisiana, as reported by R. C. Gaines: "In this particular area there has been no transition from dusting to spraying. The only reason that there are several sprayers in this area is on account of chemical defoliation of cotton plants and not the application of insecticides for cotton insect control. Airplane spraying operations for commercial cotton insect control have been limited in this area; it is mostly dusting."

The use of aircraft for treating cotton may be limited by the size of fields and other factors, but even small, hemmed-in fields one day may be no deterrent. Helicopters can meet such problems. Currently the primary obstacle in using this type of aircraft is its first cost, but one prominent manufacturer recently stated, "Within five years a good helicopter will cost no more than a Cadillac."

Entomologists persist in one recommendation with respect to cotton-insect control — that swaths be flagged or marked and that their width not greatly exceed the airplane's wing span. They trace many insect-control failures to inaccurate placing of materials and inadequate coverage along the sides of wide swaths. A. J. Chapman, of the Rio Grande Valley, expresses this view as follows: "It seems to me that one of the things that should be given particular emphasis in connection with the use of airplanes for control of cotton insects is the necessity of having flagmen to mark the width of the swaths. While most of the states recommend that flagmen be used, it has been our experience that most of the airplane dusting pilots discourage the idea. We saw several cases this past season where the cotton insects were not properly controlled, and in checking into the matter we found that in practically every case it was due to the fact that the airplane pilot had placed the swaths too wide apart."

If these random observations seem to indicate that slow progress has been made in fully utilizing aircraft for cotton-insect control, that need not be cause for discouragement, for actually considerable headway has been made in developing better equipment and methods. The dissemination and application of such knowledge is the pressing need, and several groups concerned with the problem are beginning to realize the importance of concerted effort in this direction. Operators are giving increased attention to organization. Agricultural colleges—a greater number each year—are conducting short courses. The Bureau of Entomology and Plant Quarantine has recently consolidated its aircraft operations and is placing more emphasis on educational work.

These are all encouraging signs. Encouraging also are the increased research being planned by public agencies and, most recently, the active interest of the American Society of Agricultural Engineers.

• Rhea Blake Opposes Standby Controls

WM. RHEA BLAKE, Memphis, executive vice-president, National Cotton Council, expressed the opposition of the Council to standby controls on wages and prices in testimony before the Senate committee on banking and currency March 5 in Washington.

"We are opposed to standby price and wage ceilings," Blake said, "for three reasons:

"In the first place: Price and wage ceilings are fundamentally bad for the country. Our recent experiences have taught us this lesson all over again. It is one of the clearest lessons of history, and it has been repeated many times in various countries. The hoped for benefits of artificial ceilings are always a cruel delusion, but the damage which they do is always very real. Production and sound fiscal policy give the only real answer to inflation. Rising prices have never been stopped effectively until the goods available were brought in line with the money seeking to buy them. Price ceilings only deceive the consumer, while they choke the very efforts that mean real inflation control. They destroy the meaning of contracts.

"Second: The responsibility for deciding whether ceilings are in the national interest should not be transferred to the Executive Branch on any standby basis. The question involved is a very fundamental one of national policy. Certainly, we all must recognize that the imposition of price and wage ceilings is just about the most drastic step the government can take with respect to our economic system, short of outright confiscation. And yet here we are talking about it almost as if it were an accepted part of our American system. It strikes me that there is something very dangerous about the whole idea of reducing this issue to a mere commonplace one that can be handled in standby legislation. Aren't we becoming a little too casual about the whole matter? Aren't we drifting dangerously in the direction of accepting this kind of policy as something that will be with us always? Are we actually coming to think of ceilings as something that the country can easily put on and take off as occasion demands? I hope we will keep in mind that when business and agriculture and labor are forced to go under ceilings, the adjustments which they must make are terrifically difficult, wasteful, and demoralizing—and that once they are under ceilings, the process of getting extricated from them and returning to normal price relationships is also a slow, painful, difficult matter of adjustment. The responsibility for deciding whether, in any future situation, this country should again go into the ordeal of ceilings, should never be transferred from that branch of Government which is closest to the people—the United States Congress.

"Now, I am well aware of the argument that in the event of a truly great national emergency prompt action might be necessary—that action by the Congress might be too slow. I disagree with this point of view. The Congress can act with great rapidity when the occasion demands. War was declared on Japan and Germany in less than 36 hours after Pearl Harbor. Actually, I believe an examination of our past will show that the speed with which Congress moves in an emergency varies directly in proportion to the seriousness of that emergency. And the point that needs to be made here is: *That* is precisely the speed at which we should move in imposing wage and price ceilings on the American economy. If any emergency that might arise in the future is not serious enough to precipitate prompt action by the Congress, it is not serious enough to warrant any such drastic action as the imposition of ceilings.

"Third: Industry and agriculture today face a great challenge to carry out aggressive, forward-looking campaigns for expanded markets. Unless the war spreads, the success of these campaigns will determine whether this country can avoid a bad recession and push on up toward higher standards of living and greater national strength. Management today is called upon to put great faith in the proposition that the Government is not going to hog-tie it with controls but is not going to encourage it to undertake new ventures, make new investments, and push hard for new markets. A standby price and wage control bill would represent the exact opposite of that encouragement. It would be one of the worst steps that the Government could take in the wrong direction at this time.

"The National Cotton Council therefore respectfully urges: (1) That no standby legislation be enacted delegating to the President the authority to impose price and wage controls, and (2) that all provisions of the present Defense Production Act be permitted to expire on the dates as scheduled, except for one simple authorization to allocate for defense purposes those strategic materials which are still in short supply."

Gains in Utilization of Cotton Cited by Smith

Use of cotton in women's street dresses has almost doubled since 1946, Dr. Leonard Smith, Washington, director of utilization research of the National Cotton Council, told a group of research authorities meeting at the Southern Regional Research Laboratory recently.

Speaking before a joint meeting of the Southern Agricultural Experiment Stations' relations committee and Southern Agricultural Experiment Station collaborators, the scientist said that during the period from 1937 to 1946 only 40,000 bales of cotton were used in street dress manufacture annually. In 1952, the consumption of cotton in this key apparel market amounted to 77,000 bales.

"Since 1949, the total market for fiber in women's street dresses has declined," Dr. Smith said, "but cotton has gained. The squeeze has been principally on rayon, cotton's strongest competitor in the street dress market.

"Since the dress market has been one in which rayon has enjoyed its greatest strength, because of its high luster, soft drape, and bright colors, cotton's gain is especially significant."

The cotton researcher said that the street dress market exemplifies what can happen in broadening the horizons for cotton consumption as a result of new developments in cotton technology.

"Cotton gained on its competitors in this market," he declared, "first, because of the availability of improved finishes which impart better crease resistance and high luster; second, because of the development of new textures and constructions; and third, because of the smart promotion used in bringing these advantages to the attention of women customers throughout the United States."

Dr. Smith said, however, that there is a more significant meaning in the growth of cotton usage in women's street dresses.

"This is the acceptance of cotton as a new and different basic material. For many years our fiber has been regarded as just plain cotton—a good, honest fiber with no particular personality, glamor, or outstanding appeal," he said. "But today cotton fabrics are regarded by designers as a new artistic medium, a material which offers qualities available in no other textile."

The cotton chemist said that cotton's progress throughout the apparel and household field has been outstanding during recent years. He pointed out, however, that in some industrial markets cotton has suffered severe setbacks. This he attributed to a combination of price advantages enjoyed by other materials and the ability of the synthetics industry to emphasize a particular quality needed in an industrial use.

"One way for cotton to compete effectively is for us to develop cotton fabrics for specialized applications," he asserted. "We know this can be done; indeed, we have done it."

Dr. Smith cited the example of partially acetylated cotton fabrics developed at the Southern Laboratory and now entering commercial production. He said that this development has special significance in laundry supplies and electrical insulation.

"In the laundry industry we have been suffering from the inroads of nylon, because this fiber, while more expensive, outlasted untreated cotton long enough to give a price advantage in service," he said. "Now we have acetylated cotton which will outlast nylon, cost less, and turn out a higher quality finish on the laundry. This is a market for 130,000 bales of fiber annually.

"In electrical insulation, resistance to heat, electric currents, and outdoor exposure are important properties. Acetylated cotton provides improvements in all three of these properties. This market now consumes 130,000 bales of cotton a year, but acetylated cotton provides the possibility of capturing an additional 60,000 bales now being supplied by other materials."

Boll Weevil Battle Is 60 Years Old

Research on control of the boll weevil by USDA began nearly 60 years ago, in 1894, shortly after the pest crossed the Rio Grande and began to spread in Texas. Except in 1898-1900, when Texas made a special appropriation and all of the work was handled by that state's entomologist, boll weevil research by USDA has continued to date.

Don't Blame Feed Products

Ward Asks Stockmen To Avoid Hysteria

■ X-DISEASE suspected in cases where cattle troubles come from other causes, NCPA Educational Director points out.

"Hysteria, misinformation and malnutrition are sending many cattle to market unnecessarily and may be causing the Southwestern cattle industry greater losses now than X-disease," A. L. Ward, Dallas, NCPA Educational Director, pointed out March 11 in a statement sent to Southwestern publications.

The NCPA official made his statement as cattlemen throughout the Southwest became jittery and were inclined to suspect X-disease first for all losses following a recent outbreak alleged to have been caused by contamination of one special lot of cottonseed pellets with chlorinated naphthalene.

Ward advised that the sensible approach to the problem is to secure an accurate and confirmed diagnosis by a competent veterinarian if hyperkeratosis is suspected. He added, "Malnutrition naturally is taking a very heavy toll of cattle this year because feed supplies have been scarce and cattle have come through a long drouth. Adequate nutrition is the first essential for healthy, productive herds." **(Editor's Note:** As pointed out elsewhere in this issue, crushers and ginners should help stockmen get the facts, and do everything possible to maintain the good reputation of cottonseed feed products.)

According to Dr. H. Schmidt, Texas Experiment Station veterinarian, who is one of the few authorities on hyperkeratosis, there is no foundation for fears that solvent extraction will contaminate cottonseed meal with chlorinated naphthalene and cause X-disease. He stated that chlorinated naphthalene is not a part of the solvent process and the fact that contamination occurred in one case, after the meal had been produced, cannot be judged to be the fault of the type of processing used, whether hydraulic, expeller or solvent extraction.

"Research veterinarians call attention to many past occurrences of X-disease in which there was no connection with cottonseed pellets," Ward continued. "Most instances have been the result of cattle licking farm machinery or otherwise obtaining greases which contained chlorinated napthalene. Certain types of lubricants have been alleged to contain chlorinated naphthalene to improve their adherence to metal. Extremely small amounts of such lubricants (½ of a gram daily for 10 days) have produced X-disease, or hyperkeratosis. It has been reported that in earlier cases feedstuffs other than cottonseed pellets have become contaminated with chlorinated naphthalene and produced the disease. Contaminated alfalfa pellets were blamed for one earlier outbreak, according to Dr. Schmidt.

"Dr. Schmidt points out that X-disease early symptoms are those of vitamin A deficiency. Many herds are now showing advanced symptoms of malnutrition because of the long drouth and short feed supply. Some instances of such malnutrition are being mistaken for X-disease or hyperkeratosis, by those who are not trained in detecting all the symptoms of hyperkeratosis.

"Experiments at many state and USDA Experiment Stations have proved that solvent extracted cottonseed meal, like the regular hydraulic or expeller type meal, is high in feed value and an outstanding source of supplemental protein.

"The Spur Substation of the Texas Experiment Station has just completed a 4-year test of solvent extracted cottonseed meal for fattening steers. During this feeding trial no significant difference was found between hydraulic cottonseed meal, solvent extracted cottonseed meal and soybean meal. This last year the series of tests showed daily feedlot gains of 2.23 pounds for solvent extracted cottonseed meal; 2.26 pounds for hydraulic processed cottonseed meal; and 2.24 pounds for solvent extracted soybean meal. All lots were fed three pounds of protein concentrate, per head daily, in addition to silage, alfalfa, cottonseed hulls and grain.

"Paul Marion, Animal Husbandman at the Spur Station, calls attention to their successful use of cottonseed meal in very liberal amounts at the Station. He reports that up to seven pounds of cottonseed meal, per head daily, have been fed there with very favorable results for periods ranging up to 200 days. These tests, beginning in 1934, have demonstrated that high roughage rations, liberally supplemented with cottonseed meal, either hydraulic or solvent processed, produce fast and economical gains," Ward said.

• Pink Bollworm Count Smaller in Valley

NICK DOFFING, secretary, International Pink Bollworm Advisory Committee, reported early in March that inspections in January and the first two weeks of February this year showed that pink bollworm infestation in Cameron, Hidalgo, Willacy and Starr Counties in Texas was well below that of the same period last year.

The report, which was presented at a committee meeting in Matamoros, showed very light infestation in Cameron and Hidalgo Counties, none in Willacy County and slightly higher infestation in Starr County. In Cameron one live pink bollworm was found per 100 bolls in fields where cotton was grown last year. At the same time last year the infestation rate was 13 live worms per 100 bolls.

The infestation rate in Hidalgo this year was the same as in Cameron—one per 100 bolls, compared with eight worms per 100 bolls last year. No live worms were found in any of the bolls examined in Willacy, where infestation was exceptionally heavy in January 1952. At that time the rate of infestation was 30 worms per 100 bolls. In Starr County, seven worms per 100 bolls were reported, but this was down considerably from the infestation rate of 43 worms per 100 bolls last year.

"The report looked so good I was sure there was some mistake in it," Doffing said. "I have the report on the first two weeks in February, and it backs up the January report," he added. Doffing said rains last November caused a large number of worms to come out of hibernation, which is one cause for the light infestation now. The other, and primary cause, he stressed, is the good cleanup program last year.

Doffing warned, however, that the report is so good it could cause complacency on the part of cotton farmers, which might let the infestations, light as they are, spread to damaging proportions.

The committee discussed plans for cooperation between the U.S. and Mexico on pink bollworm control during the 1953 growing season. It voted to have the secretary contact proper authorities to request an international meeting for discussion on uniform quarantine laws in the U.S. and Mexico. The group also plans to review research on pink bollworm control in order to be able to disseminate all information rapidly.

The committee, organized by John C. White, Texas commissioner of agriculture, meets the first Wednesday of each month. The next meeting will be held April 1 in Harlingen. Members attending the meeting in Matamoros included Clevc Tandy, committee chairman, Los Fresnos Gin, Los Fresnos; Albert Terrazas, committee vice-chairman, Mexican regional cotton committee president; C. B. Ray, committee vice-chairman, Rio Grande Valley Farm Bureau manager, Mercedes; Doffing; Arcadio Guerra, La Reforma Gin, Lynn; F. Earl Davis, South Texas Cotton Oil Co., Harlingen; James P. Walsh, Valley Ginners Association president, Mission Gin Co., Mission; and Mexican representatives M. Cavazos, C. Arguelles, C. Garza and A. Pacheco.

■ **N. R. CLARK, Chicago, recently retired vice-president of Swift & Co., has been presented with the first annual Industry Service Award by the Institute of American Poultry Industries.**

Fats and Oils Used for Making Plasticizers

Plastic products using plasticizers developed by USDA from vegetable oils and inedible animal fats were displayed during the week of March 8 in St. Louis at the annual meeting of the National Farm Chemurgic Council. Produced by industrial concerns from soybean oil and hog and cattle fats, the plasticizers make an otherwise brittle and rigid material soft and flexible. They are being used in making plastic garden hose, tablecloths, floor tile, drapes, upholstery material, refrigerator gaskets and table place mats.

• Get Ready Now for Garden Insects

EQUIP your garden shelf now with the supplies needed later for controlling insects on your flowers, advises Saide Hatfield, homestead improvement specialist for the Texas Extension Service. There are at least six ingredients which you will want to include. These are lindane, chlordane, poison bait, sulphur, lead arsenate, and oil emulsion.

Miss Hatfield says each ingredient is particularly efficient for control of certain insects. Lindane used as a one percent spray will help kill the aphids, the tiny insect which is active from spring until fall. You can use lindane for the adult white fly, thrips or "rose petal lice," small beetles, leaf hoppers, young squash bugs and many others, but you may need a two percent dust for the mature squash bug.

For the cutworms and some leaf-eating caterpillars, you will find chlordane, in a five percent dust or spray effective. Chlordane is also effective for killing sow bugs, white fly, lace bugs, thrips, beetles, fleahoppers and leaf hoppers. Ants and grasshoppers will also succumb to treatment with chlordane.

The best control for slugs and snails is poison bait. Sow bugs or pill bugs eat snail bait, so this is effective control for them.

Dusting sulphur will control the red spider and other tiny mites which yellow the leaves and kill evergreens, annual and other plants. It takes a spray of two or three tablespoons of lead arsenate to a gallon of water to control the bag worms if applied when they are young. The grown bag worms need a double dose of the lead arsenate spray.

Texas Research Committee Has Two New Bulletins

Two reports prepared by the staff of Cotton Merchandising Research, University of Texas, are now available. This organization is sponsored by the Cotton Research Committee of Texas.

Research report No. 20 is entitled "Fiber Properties and Related Information on the Mid-Season Cottons Grown in the Northern and Southern Blacklands of Texas, Crops of 1952-53." Research report No. 21 is entitled "Fiber Properties, Spinning Performance and Related Information for Cotton Grown in East Texas-District 5, Preliminary Report."

Both bulletins may be obtained by writing to Cotton Merchandising Research, University of Texas, Box 1645, University Station, Austin.

South Plains Farmers Plan Increase in Acreage

An increase of almost five percent in cotton acreage is considered probable for a 20-county South Plains, Texas, area, according to K. N. Clapp, district manager of Anderson, Clayton Cotton Co., Lubbock. With normal spring rainfall in the latest crop forecast, Clapp expects a 1953 acreage of 3,867,000, an increase of 157,000 over 1952.

Farmers in the area apparently will disregard Secretary of Agriculture Ezra Taft Benson's request for an 18 percent voluntary acreage cut, and it is reported that some growers are of the opinion that light moisture in the last two years drastically reduced the yields from this area, thus automatically fulfilling the Secretary's request.

Presenting

Carl T. Williams

Jackson, Tenn.

CARL TRICE WILLIAMS, Jackson, Tenn., was born in Jackson, May 20, 1911, graduated from high school and attended Union University there. He entered the ginning industry as manager of Farmers Gin Company, Brownsville, Tenn., in 1932, but in 1935 became a traveling representative of Brown Shoe Co., St. Louis. He re-entered the ginning business in March, 1940, after the death of his father, as secretary of the Farmers Gin Company, Jackson, a corporation operating two gins, bagging and ties sales department and delinting and treating establishment.

In 1940 Williams was elected to his present office of secretary-treasurer of the National Cotton Ginners' Association. He has served as secretary-treasurer and member of the executive committee of the Tennessee Cotton Ginners' Association and a delegate member of the National Cotton Council, a member of the board of stewards of the First Methodist Church, Exalted Ruler, Jackson Lodge, B.P.O.E., president of the Jackson Lions Club and on the board of directors of Jackson-Madison County Chamber of Commerce.

He married Miss Catherine Austin of Ellisville, Miss., in 1942 and they have one son, John Carlton.

• Interest in Cotton Week Sets Record

NATIONAL COTTON WEEK display materials are being issued to stores in record volume, Paul M. Jones, New York, sales promotion manager of the National Cotton Council, said.

"Retailers indicate greater interest in Cotton Week promotions this year than ever before," Jones said. "Cotton is strong in all markets, and merchants apparently are getting ready to ride the trend with aggressive promotions. They see Cotton Week as a natural time to hit hard for volume," he added.

"There is pronounced consumer interest in the styling of cotton fabrics as such," Jones said. "This holds good in piece goods and ready-to-wear. It is very evident in lingerie, where plisse particularly is running away with the market. It is happening in men's sport shirts, where cotton has been moving up fast and appears headed for its best year. We see the same story in many other departments, such as cotton rugs and carpets, which have proved a bonanza in the floor coverings market."

Jones said many merchants plan storewide promotions during Cotton Week, May 11 to 16, to capitalize on the consumer demand for cotton. "It's Cotton Time" is the theme featured on Cotton Week display units.

As of March 1, some nine weeks in advance of Cotton Time, retailers had placed orders for 19,812 posters, streamers and other display pieces. This was more than triple the total of 4,476 display pieces ordered by the same date last year. Jones said 37 buying offices, retail chains and other groups representing a total of 11,190 retail outlets have reported that they plan to participate in Cotton Time. Many others are still to be heard from, since most orders for promotional material are generally filled in April.

Last year an estimated 10,000 stores participated in Cotton Week, a record degree of participation in the 22-year history of the event up to then.

Thirty-five thousand copies of the Cotton Council's 16-page Cotton Week merchandiser have been distributed to department, chain and variety stores, specialty stores, wholesalers, manufacturers, newspaper advertising managers and member radio stations of the Broadcast Advertising Bureau.

Special community-wide celebrations in honor of Cotton Time are being planned by local committees in South Bend, Ind.; San Joaquin Valley, California; San Patricio County, Texas; Rio Grande Valley, Texas; Pecos, Texas; Los Angeles and other retail centers. Statewide Cotton Week events are scheduled in Arizona and New Mexico. Many other special Cotton Time celebrations are expected to be arranged in the next few weeks.

Beware of Burs as Livestock Feed

Ginners and crushers who have seen recent newspaper publicity regarding the feeding value of cotton burs, used on one West Texas ranch in combination with a commercial product, will do well to keep in mind that **Experiment Station results have NOT favored burs as a feed.** As pointed out in the Feb. 14 issue of The Cotton Gin and Oil Mill Press, burs should **NOT** be substituted for cottonseed hulls for livestock feeding until and unless the value reported for them in such unofficial tests has been confirmed by Experiment Stations.

Dr. J. C. Miller, head, Texas A. & M. College animal husbandry department, has said: "To this date, the work we have done on the use of cotton burs indicates that they are not even good filler, much less nutritious."

W. C. Cantrell Succeeds His Father at Bauer Bros. Co.

William C. Cantrell was recently named Southwestern Representative of The Bauer Bros. Co., Springfield, Ohio, to replace his father, Charles C. Cantrell, who is retiring after 17 years with this company.

His territory includes Texas, Oklahoma, New Mexico, Arizona, Arkansas, and Western Louisiana. Cantrell assumes the duties of sales engineer for the complete Bauer line of machinery for the oil mill, food processing, and pulp and paper industries.

Before serving with the U. S. Army Ordinance during World War II, Cantrell attended Curtiss-Wright Technical Institute at Glendale, Cal., and later attended North Texas Agricultural College at Arlington, Texas. He began working for Bauer in 1948, employed in the laboratory and later in food and milling sales.

Mr. and Mrs. Cantrell have a daughter, Sharon, and live in Fort Worth, Texas.

CCC President J. H. Davis Will Speak in Houston

John H. Davis, president, Commodity Credit Corporation, Washington, will speak at the 42nd annual meeting of the Texas Cotton Association in Houston. The meeting will be held at the Shamrock Hotel March 20-21, and Davis will address the group on Friday, March 20 at 10 a. m.

The CCC president is in direct charge of the Production and Marketing Administration, Commodity Exchange Authority and Federal Crop Insurance Corporation.

San Joaquin Valley's Crop Is Nearly Harvested

The bulk of the San Joaquin Valley's cotton crop has been picked and ginned, says O. W. Fahrney, farm placement supervisor, California Department of Employment.

On March 3 Fahrney said that 1,629,086 bales had been ginned and the expected seasonal total is 1,652,550.

Crushers Meet March 13 With Leaders at LSU

Louisiana cottonseed crushers and representatives of the National Cottonseed Products Association met March 13 at Baton Rouge with leaders at Louisiana State University to discuss cotton and research developments of interest to the industry.

• May Use Snails as Meal Supplement

OIL MILLS may, at some future date, be using meal made from a giant African snail to supplement vegetable protein meals in mixed feeds for poultry if the research findings of two University of Arizona scientists result in commercial use of the snail meal. The scientists have found that the dried snail flesh is very rich in lysine, an amino acid which is lacking in many grains and vegetable protein concentrates.

The lysine content of the big, much-feared snail suggests, the researchers said, that snail meal might be a good supplement to cottonseed meal and other vegetable feeds. The experimenters, Dr. Albert R. Mead and Dr. Arthur R. Kemmerer, reported their tests in the Journal of Science.

Trials with snail meal and vegetable meal combinations are being made at the University in Tucson.

The giant African snail has a shell about five inches long and a long neck that can reach considerably beyond the shell. He is a terrific eater. A large head of lettuce lasts him only one night. He will eat almost any fruit or vegetable.

Also he multiplies at an alarming rate. He is both male and female at the same time and can reproduce without outside help. His life span is about one year, He lays 300 eggs at a time and they hatch in 20 to 40 days, depending upon the weather.

Two centuries or more ago the giant snail branched out from his native Africa into India and Malaya and finally into the Pacific islands. He likes to live in the sheltering corners of automobiles and machinery.

After World War II some of these snails hitch-hiked to this country in surplus war materiels from Saipan and other islands but were discovered and destroyed quickly at the docks.

They did, however, get a foothold in Hawaii.

Federal and state authorities since have kept a close watch on shipments of material to this country from the snail-infested islands. They fumigate whole ship cargoes if there is any question about snail infestation.

If the Arizona experiments bear out the theory of Mead and Kemmerer the infested islands may be able to convert the big pest into something of an asset by selling dried snailflesh as a feed supplement.

New Flameproofing Process Developed by USDA Lab

A new process to flameproof cotton fabrics, known as "THPC," has been developed at the Southern Regional Research Laboratory, New Orleans, says USDA. Cloth treated by the process should be especially useful for curtains, draperies, upholstery, bedding and other household items. Treated fabrics retain flameproofness after more than 15 launderings. Information on flameproofing investigations and small samples of the fabric treated by the "THPC" process may be obtained from the Laboratory by written request.

■ **FOR NEWS of ginners' activities in your own state, make it a habit to read The Cotton Gin and Oil Mill Press, official magazine of your state ginners' association.**

From our Washington Bureau

By FRED BAILEY

Washington Representative

The COTTON GIN and OIL MILL PRESS

• **Farm Middleman on the Spot** — The "middleman"—the farm businessman—is on the spot in Washington. Processors, handlers, distributors of farm commodities, who in recent years have fought "government interference" and "federal handouts," now have had the ball tossed to them. If they don't do something with it, there may be a long wait for another good chance to make a diligent search for ways and means of lessening government influence over enterprise.

This is the long-term meaning of the recent flurry of Benson appointments of commodity committees to consider price problems. At meetings with cotton and cottonseed groups, among many others, the Secretary has made it abundantly clear that he would like to see agriculture solve its own problems.

What he hasn't made clear, but probably feels deeply, in the opinion of Washington, is the need for early answers to vexing price difficulties. Congress has made pretty apparent its belief that present federal aids must be continued—and probably expanded—unless he can come up with some ideas, and soon.

Benson's answer, for the time being, is to look toward farm leaders and trade groups for new approaches. If they fail him, whatever eventual answers there may be probably will come from the government itself.

• **Cotton Loan Plans** — The USDA's urgent need for solutions to price problems does not mean that anyone here expects new programs could be put in force overnight. That would take time, and present support laws in any case probably will be allowed to run their course.

What Benson needs are some imaginative plans and proposals that will convince Congress the job can be done with fewer federal funds — plans that they would be willing to give a try as opportunities occur with the demise of present laws. To a limited degree, changes are already possible, especially in the administration of various price programs.

Thus, Bensen's advisory committee on cotton loans already has recommended that these be handled as in 1951. The general effect would be to reduce the activity of PMA committees in the cotton program—to increase the part played by the trade.

The loan committee, representing bankers, merchants, warehousemen as well as producers, is now putting its conclusions into the form of recommendations for action by the Secretary.

• **May Cut Power of CCC**—There is increasing talk in Washington of reducing powers of USDA's Commodity Credit Corporation in handling of crops generally. Theory is that CCC should merely underwrite with guarantees, leaving banks to put up the money, and the trade to handle mechanics of loans and storage. This would have the automatic effect of reducing the powers of the PMA, long a target of the GOP.

• **Outlook Still Good**—Business is still good, and USDA economists think it's going to continue that way at least for a while. Consequently, they believe that farm prices, still going down when officials last felt the agricultural pulse, will level out and firm up.

Here's how the economists sum up the general picture:

"Good business in prospect for the next few months is expected to keep consumer income at record levels.

"Demand from consumers, business and the government is strong. Prospects that investment . . . will continue high and that defense spending will increase further indicate that demand will continue strong."

• **Crushers Encouraged** — Crushers are encouraged by USDA changes in its program for sales of cottonseed products, particularly the decision to offer government stocks of linters each week on an offer and acceptance basis.

Already, substantial quantities have been sold since the new program went into effect. USDA is refusing all offers to buy chemical linters unless the price reflects at least 5 cents per pound on basis of 73 percent cellulose, with premiums and discounts of 6 points for each 1 percent above or below 73 percent.

The Department, according to the Cotton Council, also plans to sell 25,000 tons of cottonseed meal from its stock of some 62,000 tons now on hand.

Tenders of 1952 crop cottonseed oil to CCC through mid-February totaled 569 million pounds, or about 35 percent of the expected output in the crop year. March 30 is the last date on which tenders may be made.

• **More States Okay Margarine** — Two more states—South Dakota and Montana—have joined the parade to okay the sale of yellow margarine. It is hoped that Iowa, with a bill now pending in the legislature, will be the next in line.

• **Another Drouth?**—U.S. Weather Bureau officials, in unofficial moments, are not encouraging about the long-term outlook. They are careful to avoid official predictions for more than 30 days ahead, but privately they expect some serious dry areas again this year.

Some of them believe, despite good rains over much of the South and Southwest this winter, that next summer will be tough.

Studies of long-time weather trends indicate that '53 weather probably will not differ greatly from '51 and '52. Dry cycles usually have run a 3-year course. Fact that subsoil moisture this year is less adequate than in the recent past could complicate matters.

North Carolina Schedules 1953 Cotton Contest

More than $3,000 in cash prizes will be offered to North Carolina county, district and state winners in the 1953 five-acre cotton contest, J. A. Shanklin, cotton specialist for the State College Extension Service and chairman of the State Cotton Working Committee, has announced.

Shanklin said that the production and quality demonstration contest is being sponsored by the State Cotton Committee in cooperation with the North Carolina Cottonseed Crushers Association, North Carolina Cotton Growers Cooperative Association, cotton ginners and other groups.

The primary purpose of the contest is to improve the quality and lower the cost of cotton production in North Carolina. Any North Carolina farmer—landlord or tenant—producing as much as five acres of cotton in one area is eligible to compete for a state first prize of $800, state second prize of $400, and prizes of $300, $200 and $100 offered in each of three districts.

Stewart & Stevenson Man Receives Diesel Award

R. Loden, sales engineer of Stewart & Stevenson Services, Inc., Houston, is the of the ten men to be honored by the Detroit Diesel Engine Division of General Motors for outstanding sales achievements in 1952. As leader in the sale of GM Diesel engines in a sales zone which includes Oklahoma and Texas, Loden has qualified for the division's annual W. T. Crowe Diamond Award. He will receive a ring, a certificate of merit and will be sent to Detroit in June for appropriate ceremonies and a three-day cruise on the Great Lakes.

■ **CLARENCE E. ELSAS, Atlanta, president, Fulton Bag and Cotton Mills, has been elected president of the Textile Bag Manufacturers Association.**

Plan Now to Attend Ginners' School

Ginners will have an opportunity soon to attend some of the most important events of 1953. These are the schools for gin operators conducted through the cooperation of gin machinery manufacturers, ginners' associations and Extension ginning specialists. Every gin owner, operator or employee who attends one of these schools will obtain practical, helpful information.

The dates and other information about the schools—April 15 in Altus, Okla., April 20-28 in Memphis, and May 4-16 in Dallas—are contained in the calendar in The Cotton Gin and Oil Mill Press. Secretaries of state ginners' associations or Extension ginning specialists will be glad to provide any assistance or information a ginner needs to enable him to take advantage of the opportunity that these schools offer. Gin owners are urged to make their plans to attend, and to see that their employees attend these schools.

Conference Report

(Continued from page 43)

ited commercial basis for cotton insect control during the last 5 years. It has given good results against the cotton fleahopper, the rapid plant bug, the fall armyworm, grasshoppers, the sand wireworm, darkling beetles, and thrips. Results against the boll weevil and lygus bugs have not been consistent. It will not control the bollworm, the pink bollworm, the yellow-striped armyworm, the cotton aphid, stink bugs, or spider mites.

For the insects against which chlordane is effective, from 0.5 to 1.5 pounds of the technical material per acre is required.

When used during mid- or late-season treatments for over-all cotton insect control, chlordane should always be formulated with DDT in the ratio of two parts of chlordane to one part of DDT. From 1 to 1.5 pounds of technical chlordane and from 0.5 to 0.75 pound of technical DDT per acre should be applied. It is effective as a dust or spray.

The populations of cotton aphids and spider mites may increase to damaging proportions after application of chlordane-DDT sprays and dusts. Careful inspections for these two pests should be made at weekly intervals after such application. If the numbers of either species increase, appropriate measures should be taken to control them as outlined under the respective pests.

(See Hazards and Precautions in the Use of Insecticides.)

• **DDT**—DDT will effectively control the bollworm, the pink bollworm, the fall armyworm, the tarnished plant bug, and other lygus bugs, the garden webworm, the cotton leaf perforator, the western yellow-striped armyworm, the beet armyworm, darkling ground beetles, flea beetles, the white-lined sphinx, the green stink bug, the southern green stink bug, the rapid plant bug, the cotton fleahopper, and thrips. In some instances, unsatisfactory results against thrips have been reported when the temperature exceeded 90° F. It will also control certain species of cutworms and to a lesser extent the yellow-striped armyworm. It will not control the boll weevil, the cotton leafworm, spider mites, the cotton aphid, and grasshoppers.

As a dust on cotton, DDT is ordinarily used at concentrations of 5 to 10 percent, either alone or in combination with other insecticides and miticides, at 10 to 30 pounds per acre. At least 15 pounds per acre of 10-percent DDT should be applied for pink bollworm control.

Sprays and dusts containing DDT are about equal in effectiveness against cotton pests. Thorough coverage of the plant and proper timing of applications are more important than the type of formulation used.

Aphid and mite populations may increase until they cause severe injury where DDT is used, unless an aphidicide or a miticide is included in the formulation.

DDT is toxic to certain plants such as cucurbits. Its toxicity persists and accumulates in the soil. Therefore, it should be used only in the minimum amounts recommended for cotton insect control, especially on light sandy soils. Contamination of adjacent crops from drift should be avoided.

DDT is highly toxic to fish and amphibians, and precautions should be taken to avoid the possibility of polluting streams.

Acute toxicity of DDT to man and animals is rather low compared with inorganic insecticides now used on cotton. However, when DDT is repeatedly ingested or brought into contact with the skin, it may be absorbed and stored in the fatty tissues. Injury to the liver may also result. Unnecessary exposure of operators should be avoided.

(See Hazards and Precautions in the Use of Insecticides.)

• **Dieldrin**—Dieldrin will effectively control the boll weevil, thrips, stink bugs, the cotton fleahopper, lygus bugs, the rapid plant bug, the fall armyworm, grasshoppers, the variegated cutworm, the pale-sided cutworm, the granulate cutworm, the yellow-striped armyworm, and the garden webworm. It is not effective at low dosages for bollworm control and DDT should be added when control of this insect is necessary. Dieldrin may increase the numbers of spider mites and aphids. Against boll weevils dieldrin should be applied at the rate of 0.15 to 0.5 pound per acre. It will kill newly hatched cotton leafworms at dosages effective against the boll weevil. It is effective either as a dust or spray.

Dieldrin is toxic by skin absorption, by inhalation, and by ingestion. It is recommended for use on cotton only where persons applying it will follow the precautions prescribed by the manufacturers.

(See Hazards and Precautions in the Use of Insecticides.)

• **Heptachlor**—Heptachlor was used experimentally for cotton-insect control in many locations throughout the Cotton Belt in 1951 and 1952 and was recommended for this control in several states in 1952. It is effective against the boll weevil when applied at the rate per acre of 0.25 to 0.75 pound, against thrips and cotton fleahoppers at 0.125 pound, against cutworms at 1 pound, against garden webworms at 0.5 pound, and against grasshoppers at 0.25 to 0.5 pound. Heptachlor will not control the bollworm, the yellow-striped armyworm, the pink bollworm, the cotton leafworm, the cotton aphid, or spider mites. Heptachlor and heptachlor-DDT mixtures may increase spider mite and aphid populations.

(See Hazards and Precautions in the Use of Insecticides.)

• **Lindane**—Lindane, the essentially pure gamma isomer of BHC, may be substituted on an equivalent weight basis for the gamma isomer of BHC in formulations of insecticides used on cotton insects.

Lindane is toxic to warm-blooded animals. It may enter the body through absorption, inhalation, or ingestion. Proper precautions should therefore be observed in its use.

Lindane dusted or slurried onto planting seed at the rate of 2 ounces per 100 pounds will control wireworms, seed corn maggots, and false wireworms.

(See Hazards and Precautions in the Use of Insecticides.)

• **Methoxychlor** — Dusts containing 10 percent of methoxychlor controlled the cotton leafworm, but lower concentrations gave poor control.

Methoxychlor gave slightly better control of the pink bollworm than DDT, but a heavy build-up of aphids usually followed its use and it failed to control bollworms. Therefore, it is not being generally used for pink bollworm control.

Methoxychlor is less effective than the insecticides now recommended for the

Directors Elected by Carolinas Ginners

DIRECTORS elected at the recent annual convention of the Carolinas Ginners' Association are shown above. Front row, l. to r.: Clyde E. Upchurch, Jr., Raeford, vice-president for North Carolina; Myres W. Tilghman, Dunn, N. C., president; Frank M. Wannamaker, St. Matthews, vice-president for South Carolina; J. F. McLaurin, Bennettsville, S. C., president, National Cotton Ginners' Association. Second row, l. to r.: G. T. McLees, Westminster, S. C.; Wilfred R. Cato, Emporia, Virginia; Jack W. Robbins, Scotland Neck, N. C. Third row, l. to r.: Forrest S. Crowder, Lattimore, N. C.; Talley E. Smith, Rowesville, S. C.; O. L. Edwards, St. Charles, S. C.; Clifford H. Hardy, executive secretary and treasurer. Absent from photograph are W. E. Ashcraft, Monroe, N. C.; J. M. Barr, Leesville, S. C.; and Carl T. Hicks, Walstonburg, S. C.

control of the boll weevil, the bollworm, the cotton aphid, the garden webworm, spider mites, and stink bugs. It is less toxic than DDT to warm-blooded animals and it is less likely to be stored in the fat or excreted in the milk.

(See Hazards and Precautions in the Use of Insecticides.)

• **Nicotine**—Two percent of nicotine alternated with applications of calcium arsenate alone will usually prevent a cotton aphid build-up, if properly applied. The period between nicotine applications should not exceed 8 to 10 days.

Either 2 or 3 percent of nicotine in a suitable carrier can be used to knock out heavy aphid infestations. At least 0.2 pound per acre of free-nicotine equivalent should be applied. The source may be either nicotine sulfate or a fixed nicotine in dust form.

Nicotine dusts to knock out heavy aphid infestations should be applied when the air is calm and preferably when there is no dew on the plants. Complete coverage is essential.

Nicotine is highly toxic to man and animals and should be used with adequate precautions.

(See Hazards and Precautions in the Use of Insecticides.)

• **Parathion**—Parathion will control the cotton aphid, spider mites, the garden webworm, and the cotton leafworm when applied at the rate of 0.125 to 0.25 pound of the technical material per acre. It may be applied as a dust or spray. It may be used as a 1-percent dust alone or in combination with other insecticides. It gives very little control of the boll weevil, the fall armyworm, the variegated cutworm, the bollworm, and the pink bollworm. Bollworm infestations sometimes increase after applications of parathion.

Parathion is a dangerous poison. It is much more toxic to warm-blooded animals than most poisons used in cotton insect control. Therefore, it should be handled with extreme caution and the directions prescribed by the manufacturers should be strictly followed.

(See Hazards and Precautions in the Use of Insecticides.)

• **Rotenone**—One percent of rotenone in calcium arsenate at each application made against the boll weevil has given satisfactory control of the cotton aphid.

• **Sulfur**—Sulfur has been widely used in dust mixtures on cotton for control of certain species of spider mites and the cotton fleahopper. It sometimes has a repressive effect upon aphid populations in some areas. Where spider mites are a problem, at least 40 percent of sulfur should be included in all dust mixtures to prevent the development of damaging infestations of the sulfur-susceptible species and as a depressant of the others. Sulfur is most effective when finely ground and when applied at temperatures above 90° F.

• **Systox** — Systox is effective against cotton aphids and all species of spider mites for 2 to 8 weeks at dosages from 0.2 to 0.5 pound per acre. For soil treatment 2 to 4 pounds per acre are required, and for seed treatment 0.25 to 0.50 pound. In addition to systemic activity, Systox also has shown marked activity as a contact insecticide against spider mites and aphids. It does not control the boll weevil, the bollworm, the cotton leafworm, thrips, the pink bollworm, or grasshoppers at the dosages that are effective against mites and aphids.

Systox is a dangerous poison. It is much more toxic to warm-blooded animals than most poisons used in cotton insect control. Therefore, it should be handled with extreme caution and the directions prescribed by the manufacturers should be strictly followed.

(See Hazards and Precautions in the Use of Insecticides.)

• **TEPP**—TEPP at the rate of 0.5 to 1.0 pint of the 40-percent concentrate, or its equivalent, will control cotton aphids and some species of spider mites when used on dry plants at proper intervals. Several applications may be required for spider mite control.

This chemical deteriorates rapidly when exposed to moisture or moist air and is incompatible with alkaline materials. It should be applied immediately after being mixed with water. Residual toxicity of the chemical is very short.

TEPP is a dangerous poison. It is much more toxic to warm-blooded animals than most poisons used in cotton insect control. Therefore, it should be handled with extreme caution and the directions prescribed by the manufacturers should be strictly followed.

(See Hazards and Precautions in the Use of Insecticides.)

• **Toxaphene** — Toxaphene will control the boll weevil, the fall armyworm, the garden webworm, the cabbage looper, the tarnished plant bug, the rapid plant bug, the cotton leafworm, cutworms, and grasshoppers, when applied at the rate of 2 to 3 pounds of the technical mate-

rial per acre. It is less effective against the bollworm and yellow-striped armyworm. It will control the cotton fleahopper and thrips when applied at the rate of 0.75 to 1 pound of the technical material per acre. When properly applied dusts and sprays are about equally effective in most areas. It is effective against the salt-marsh caterpillar at 4 to 5 pounds per acre.

Bollworm control was improved where DDT was incorporated in the toxaphene spray mixture at the rate of 0.25 to 1 pound per acre. Toxaphene alone will not give adequate control of the pink bollworm.

Suppression of the cotton aphid was not satisfactory where toxaphene was used throughout the season. It will not control heavy aphid infestations, nor will it control spider mites, and its use may result in their increase. Therefore, in some areas it is recommended that dusts contain at least 40 percent of sulfur, or an appropriate amount of some suitable miticide.

(See Hazards and Precautions in the Use of Insecticides.)

Insecticides and Miticides That Show Promise for Commercial Use and Are Recommended for Large-Scale Field Trials During 1953.

• **Chlorthion (Compound 22/190)** (A phosphoric acid ester related to parathion containing chlorine) — This phosphorus compound is reported to be nontoxic to warm-blooded animals. It was tested against the boll weevil, the bollworm, the cotton aphid, and spider mites in laboratory and field cages and in field plots during 1952. It appears promising for control of the boll weevil at dosages ranging from 0.25 to 0.75 pound of the technical material per acre. At this dosage, aphid control would be highly satisfactory and the build-up of damaging spider mite infestations would likely be prevented. It is not effective against the bollworm at these dosages and should be formulated with DDT when used for over-all cotton insect control.

(See Hazards and Precautions in the Use of Insecticides.)

• **Endrin**—Endrin (Compound 269) was used as a spray in large-scale field tests for cotton insect control in many locations throughout the Cotton Belt in 1952. It is effective against the boll weevil and the bollworm when applied at the rate of 0.2 to 0.5 pound per acre; against thrips, the cotton fleahopper, and lygus bugs at 0.1 pound per acre; and against the cotton leafworm at 0.2 pound per acre. Endrin did not control spider mites, aphids, or the pink bollworm.

Endrin is toxic by skin absorption, by inhalation, and by ingestion. It is recommended for use on cotton only where persons applying it are fully aware of the hazards involved and will follow the precautions prescribed by the manufacturers.

(See Hazards and Precautions in the Use of Insecticides.)

• **EPN**—EPN was used experimentally for cotton insect control in many locations throughout the Cotton Belt in 1952. It is effective against the boll weevil when applied at a rate of 0.5 to 0.75 pound per acre; against the yellow-striped armyworm at 0.3 pound per acre; and against thrips, the cotton fleahopper, the cotton leafworm, and some species of spider mites at 0.25 pound per acre. Aphids and bollworms may build up to damaging numbers after its use, but spider mites do not.

A mixture of EPN and DDT was more effective against the pink bollworm than DDT alone. EPN at the rate of 1 pound per acre showed promise for pink bollworm control.

EPN is a dangerous poison. It is much more toxic to warm-blooded animals than most poisons used in cotton insect control. Therefore, it should be handled with extreme caution and the directions prescribed by the manuafcturers should be strictly followed.

(See Hazards and Precautions in the Use of Insecticides.)

• **Isodrin (Compound 711)** — In South Carolina isodrin gave effective control of the boll weevil at 0.2 pound per acre, both as a dust and a spray. At this dosage it ranked first in six out of seven field-plot experiments against this insect.

In Texas isodrin gave good initial kill of thrips and the cotton fleahopper when applied at 0.1 pound per acre and against the cotton leafworm at 0.3 pound in limited field tests.

When mixed with DDT it usually caused an increase in aphids and spider mites, although less than most of the insecticide formulations recommended for boll weevil and bollworm control. When used alone it usually did not cause an increase in these pests.

Isodrin was not effective against the bollworm, the fall armyworm, the yellow-striped armyworm, aphids, and spider mites.

Isodrin is toxic by skin absorption, by inhalation, and by ingestion. It is recommended for use on cotton only where persons applying it are fully aware of the hazards involved and will follow the precautions prescribed by the manufacturers.

(See Hazards and Precautions in the Use of Insecticides.)

• **Malathon** — This compound appears promising for the control of spider mites and the cotton aphid at a dosage of 0.25 to 0.5 pound of the technical material per acre.

(See Hazards and Precautions in the Use of Insecticides.)

• **Methyl Parathion (Methyl ester of parathion)**—This compound was widely tested during 1952 and continues to appear promising against the boll weevil at dosages between 0.25 and 0.5 pound of the technical material per acre although at the lower strength, results have not been consistent. Within this range, it would be highly effective against the cotton aphid, spider mites, and the cotton leafworm. It is not effective against the bollworm.

Methyl parathion is a dangerous poison. It is much more toxic to warm-blooded animals than most poisons used in cotton insect control. Therefore, it should be handled with extreme caution and the directions prescribed by the manufacturers should be strictly followed.

(See Hazards and Precautions in the Use of Insecticides.)

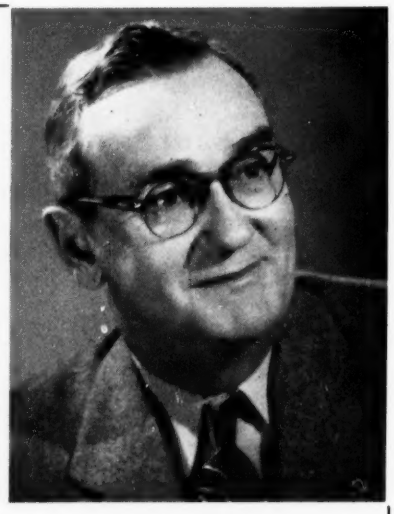
• **Ovotran**—This material will effectively control all species of spider mites when applied at the rate of 2 to 3 pounds of technical material per acre. Thorough treatment and contact of the mites is essential for good control. Its action is somewhat slower than Aramite. Where immediate "knock down" of mites is essential, the addition of parathion or TEPP to ovotran should be considered.

• **Schradan**—Schradan was translocated by cotton plants in laboratory tests when it was applied to soils in which the plants were growing. A single soil application of 4 to 8 pounds of the compound per acre caused the plants to remain toxic to cotton aphids and spider mites for several months. In laboratory and field tests spray application to foliage of 0.5 to 1 pound per acre gave aphid and mite protection for 2 to 4 weeks. Cotton seedlings grown from seed treated with 1 pound of schradan per 100 pounds of seed were toxic to aphids and mites for 6 weeks. Schradan was ineffective against the boll weevil, the bollworm, the pink bollworm, the cotton leafworm, the cotton fleahopper, thrips, and a number of other cotton insects.

Schradan is a dangerous poison. It is much more toxic to warm-blooded animals than most poisons used in cotton insect control. Therefore, it should be

Plan, Purchase Needs Early

By J. P. ROSS
President, Arkansas-Missouri Ginners' Association



■ SINCE GINNERS generally serve as suppliers of insecticides they should alert their farmer customers to the importance of early planning on types and kinds and amounts of insecticides to be used. They should also urge early purchase of the materials decided upon.

These two steps—early planning and early purchase—might well offset a disastrous year for the farmer. Wise farmers will also consider alternative plans of control since infestations are variable both in kind and intensity.

Purchase of adequate equipment is also an item of importance as is the safe use of that equipement during application of the insecticide. Attention to these items might well be the insurance policy against substantial financial loss.

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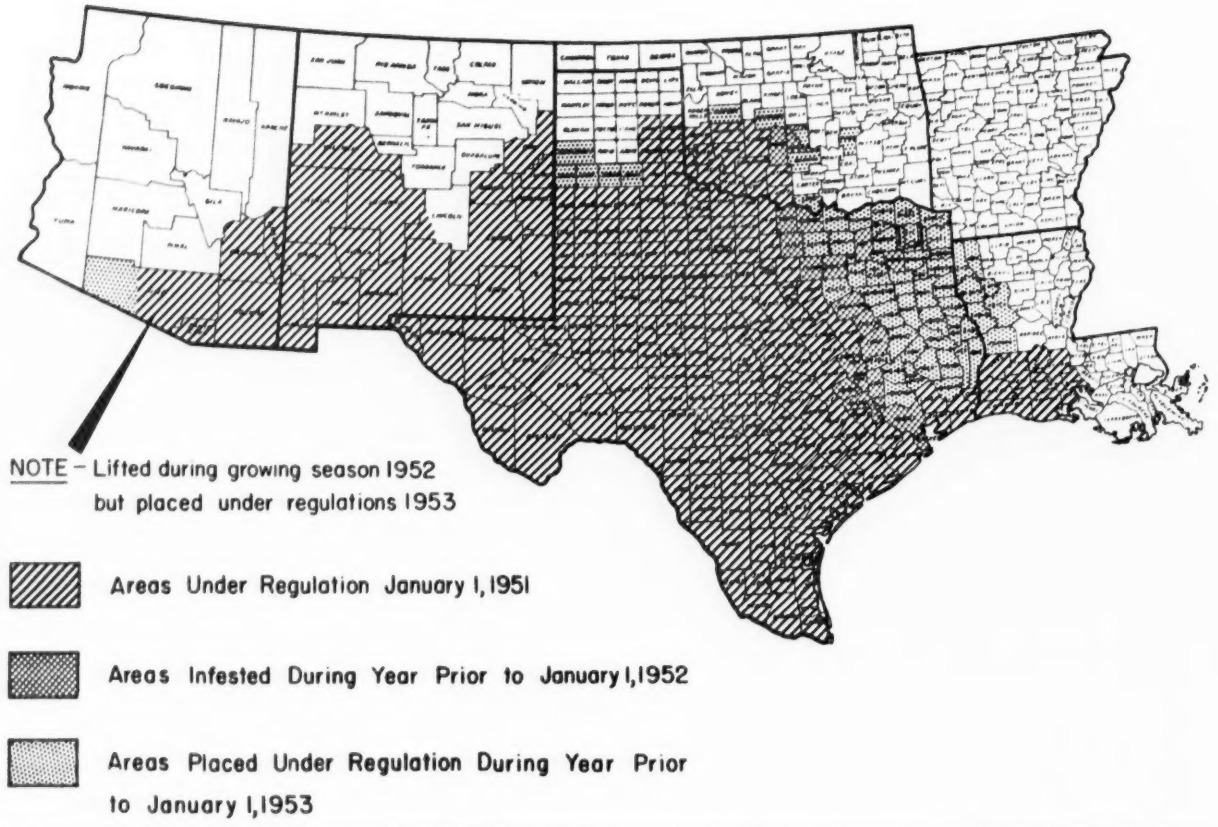
PINK BOLLWORM REGULATED AREAS
JANUARY 1, 1953



handled with extreme caution and the directions prescribed by the manufacturers should be strictly followed.

(See Hazards and Precautions in the Use of Insecticides.)

• **Strobane (B. F. Goodrich Insecticide 3960-X14)** — This material, which is a mixture of chlorinated terpene isomers having approximately 65 percent of chlorine, was considerably less effective than toxaphene against the boll weevil and the cotton leafworm in field-cage tests. The amounts of active ingredient per acre required to cause mortalities of 50 percent against the boll weevil were 1.05 and 2.05 pounds, respectively, for toxaphene and Strobane; against the cotton leafworm, these amounts were 0.84 and 1.04 pounds, respectively.

Strobane is about as toxic to warm-blooded animals as toxaphene and should be handled with care.

(See Hazards and Precautions in the Use of Insecticides.)

Suggested Methods for Making Uniform Surveys to Determine the Abundance of Cotton Pests

• **Boll Weevil**—Survey records are made in a number of states to determine the winter survival of the boll weevil. Counts are made in the fall soon after weevils enter hibernation and again in the spring before they emerge from winter quarters. A standard sample is 2 square yards of surface woods trash taken from the edge of a field where cotton was grown during the season. At least five samples are taken from a field.

In most states boll weevil population counts are made on seedling cotton to determine the number of weevils entering cotton fields from hibernation quarters. The number per acre is figured by examining the seedling plants on 50 feet of row in each of five respresentative locations in the field. Additional counts are desirable in large fields.

Examination for boll weevils are made weekly after the plants are squaring freely or have produced as many as three squares per plant. One hundred squares are examined while walking diagonally across the center of the field. The squares should be one-third grown or larger, and an equal number should be picked from the top, middle, and lower branches of the plants. Squares from the ground or dried-up squares that are "hanging" on the plant should not be picked.

An alternative method is to count about 25 squares in each of several locations distributed over the field. The percentage of infestation is determined by counting all squares that have egg or feeding punctures. However, the number of sample counts will depend upon the size of the field and the surrounding environment. Accurate infestation records in large fields will require additional counts in different parts of the field.

• **Bollworm**—Examinations for bollworm eggs on cotton are started when most of the corn silks begin to dry, or at the time bollworms usually appear, and are repeated every 5 days thereafter until the crop has matured.

Terminals (about 3 or 4 inches of the top of the cotton plant) of 100 main stems are examined for eggs and worms. When first deposited, the eggs are white and about the size of mustard seed. As hatching time nears, they change to a dirty white. These eggs usually will be found scattered on the terminal portions of the plant.

If eggs are found on the terminals and 4 or 5 young worms in small squares or on tender top leaves, infestation is high enough to start treatment. To obtain effective control, no time should be lost in applying poisons. Apply poison at 5-day intervals as long as necessary.

To determine the injury caused by this pest, the percentage of injured squares and bolls should be recorded at 5-day

Quotes From Our Authors:

"THE FUTURE VALUE (of the airplane in insect control) will be limited only by our capacity to understand its peculiar characteristics—its virtues and its limitations." — KENNETH MESSENGER.

intervals. A sufficient number of squares and bolls should be examined to obtain adequate samples of a given field.

• **Cotton Aphid**—The aphid infestation is classified according to the number of aphids estimated per leaf as follows: Class 1—0; Class 2—1 to 10 per leaf; Class 3—11 to 25 per leaf; Class 4—26 or more per leaf.

Beginning at the margin of the field and while walking diagonally across it, 100 leaves should be examined successively from near the bottom, near the middle, and near the top of the plants.

• **Cotton Fleahopper** — Weekly inspections should be made as soon as the cotton is old enough to produce squares and should be continued until the crop is set and begins to mature. The main stem terminal "bud" of 100 cotton plants per field, including about 3 or 4 inches of the terminal bud or top of the cotton plant should be examined. Both adults and nymphs should be counted. The number per 100 terminals being recorded as the infestation for the field.

The examinations should be made at several representative points diagonally across a field, 33 terminal buds being inspected approximately 50 feet from each of the 2 corners and 34 terminal buds at the center of the field.

• **Cotton Leafworm**—Two types of damage to the leaves are produced by the feeding of the cotton leafworm — (1) Semitransparent spots where newly hatched larvae are feeding on the lower surface of the leaf; and (2) ragging where larger larvae are eating through the entire leaf.

Numerous semitransparent spots, with small larvae present, indicate that a heavy infestation is developing. Three levels of infestation, based on the degree of ragging and the number of larvae, are suggested:

Class 1—Few leaves ragged and few larvae observed.

Class 2—2 to 3 leaves per plant 1/3 to 1/2 destroyed by ragging, and 2 to 3 larvae per plant.

Class 3—Extensive damage to most leaves with 6 to 8 or more larvae per plant.

• **Pink Bollworm Bloom Infestation** — After cotton has been blooming at least 5 days, pink bollworm infestation counts may be made on the basis either of the percentage of blooms infested or the number of worms per acre. To determine the percentage of blooms infested, record the number of infested and noninfested blooms of a representative number of blooms distributed over the field. To determine the number of worms per acre, step off 100 steps or 300 feet at each of five locations in the field or a total of 1,500 feet of row length and count the number of infested blooms on this area. The number of infested blooms multiplied by 10 will give the approximate worm population per acre.

Boll Infestation: While walking diagonally across the field, collect at random 100 green bolls that are hard or firm when pressed. Examine each boll as follows: Remove the bracts and calyx by cutting off a thin slice of the base of the boll; cut each section of the boll midway between the sutures so that each lock can be removed intact; examine the inside of the carpel for the characteristic tunnels or mines made by the young larvae. The number of bolls found infested represents the percentage of infestation.

• **Spider Mites**—Classify the infestation by estimating the number of adult females per leaf as follows: Class 0—No infestation; Class 1—1 to 10 per leaf; Class 2—11 to 25 per leaf; Class 3—26 or more per leaf.

Beginning at the margin of the field and walking diagonally across it, examine 100 leaves or more taken successively from near the bottom, near the middle, and near the top of the plants.

Cultural Practices That Aid in the Control of Cotton Insects

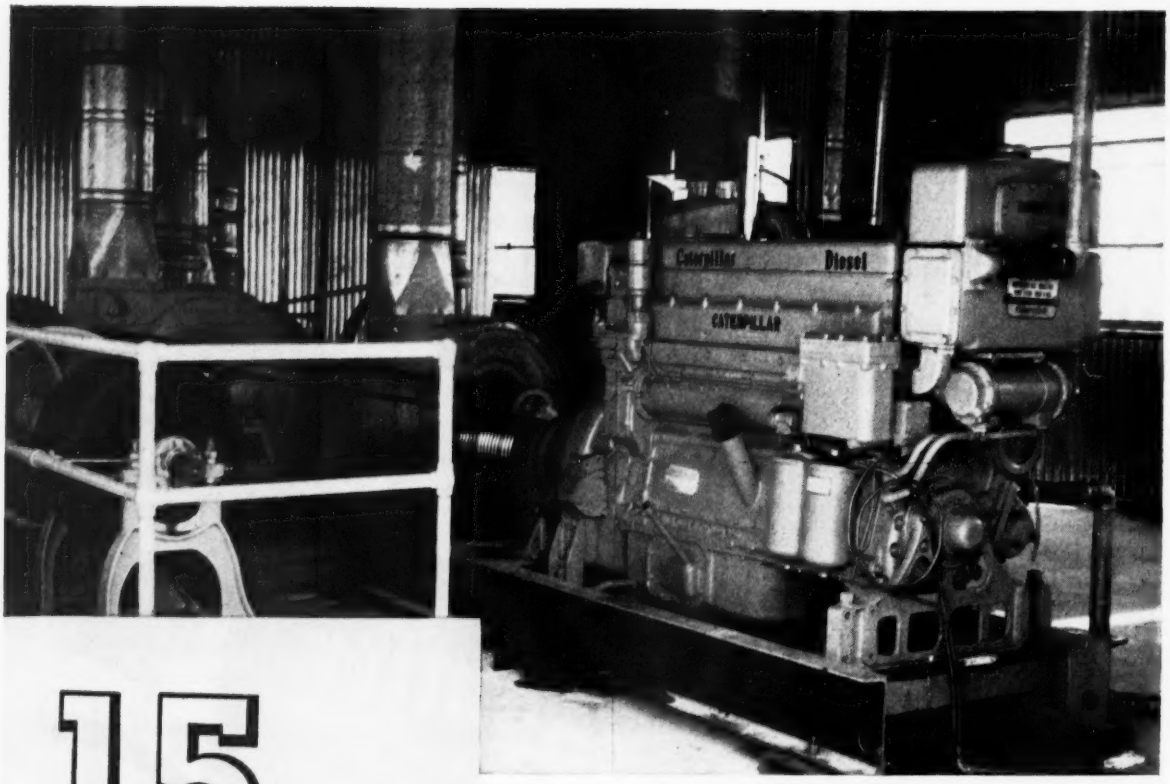
Certain cultural practices reduce cotton losses from insect pests. They often reduce, and may elminate, the need for insecticides, and therefore should be encouraged. Several of these practices can be used by every cotton grower, whereas others are applicable only to certain areas and conditions. Besides following these practices, growers should continue to make careful observations for insects and apply insecticides when needed.

• **Planting** — Reasonably early planting of all cotton during a short period within an area enables the crop to produce maximum growth and fruit before insects multiply and spread from field to field. Early planting also makes earlier stalk destruction possible.

• **Varieties** — Varieties of cotton that bear prolifically, fruit early, and mature quickly may set a crop before the boll weevil and other insects become numerous. This is especially true when other cultural control practices are followed.

• **Soil Improvement** — Cotton growing rapidly in rich soil can stand more insect injury without material reduction of

(Continued on page 66)



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Cotton Gin Engines

(Continued from page 63)

yield than cotton growing in poor soil. Fertilization, rotation of crops, and plowing under of green manure generally tend to offset insect losses for this reason.

• **Other Host Crops of Cotton Pests**—Cotton fields should be located as far as is practicable from other host plants of cotton insects. Thrips breed in onions, potatoes, carrots, and some other crops. They later move in great numbers into adjacent or interplanted cotton. Garden webworms, variegated cutworms, and lygus bugs may migrate to cotton from alfalfa. The cotton fleahopper migrates to cotton from croton and other weeds.

• **Hibernation Areas** — Boll weevils hibernate in well-drained, protected areas in and near cotton fields during the winter. Spider mites hibernate in low-growing plants in or near fields. Clean cultivation reduces weevil hibernation quarters. Small patches of weeds near fields, along turnrows and fences, or around stumps and scattered weeds in cultivated fields or pastures can be destroyed at small cost. Such practices are more effective where the cotton acreages are in sizeable blocks than in small patches. General burning of ground cover in woods is not recommended.

• **Early Stalk Destruction**—The destruction or killing of cotton plants as early as possible before the first killing frost, either by mechanical or chemical methods, forces boll weevils into starvation before they go into winter quarters. Early stalk destruction, especially over community- or county-wide areas, has greatly reduced the boll weevil problem in the Lower Rio Grande Valley and other parts of Texas. The importance of this practice is also recognized in pink bollworm control in most areas. Plowing under the crop residue as deeply as possible after the stalks are cut also will reduce the pink bollworm survival. Modern mechanically-operated stalk cutters and shredders facilitate early stalk destruction and complete coverage of crop residues.

• **Legumes in Relation to Cotton Insect Control** — Soil-building and soil-conserving leguminous crops are generally fundamental in a cotton-growing program. It is recognized that a number of insects attack legumes and then transfer to cotton, thereby increasing the cotton insect problems. This situation may have a tendency to discourage the use of legumes, but this should not be so. Entomologists should give serious consideration to controlling insects on both legumes and cotton.

Chemical Defoliation as an Aid to Insect Control

Chemical defoliation of cotton aids in the control of many cotton insects. It checks the growth of the plants and accelerates the opening of the bolls, thereby reducing the damage and the late seasonal build-up in the population of the pink bollworm and the boll weevil to infest next year's crop. It also prevents damage to open cotton by heavy infestations of aphids and the cotton leafworm.

Early defoliation permits quicker harvesting and better use of mechanical pickers. It also permits earlier destruction of the stalks, an important aid in the control of the pink bollworm and the boll weevil. However, if losses in yield and quality are to be avoided, the youngest bolls to make cotton should not be less than 30 days old at the time of defoliation.

Detailed guides for use of different defoliants, and rates and methods of application, will be found in the Annual Report of Progress from the Cotton Defoliation Conference, issued by the National Cotton Council of America, Memphis, Tenn. These guides to the use of the defoliation process are based on broad ecological areas, rather than on state boundaries. An individual should consult local agricultural specialists if he has any doubt concerning proper methods, time of application, or actual need for the process.

Machines of NO Value in Increasing Yields of Cotton

• **Bug-catching Machines**—Bug-catching machines are not recommended as a means of controlling cotton insects.

• **Electronic Devices**—No evidence has yet been discovered by any recognized research agency which would support claims of effectiveness of so-called electronic devices for the control of insects in the field. Such devices are not recommended.

Production Mechanization in Cotton Insect Control

In the mechanization of cotton production more and more cotton is being cultivated with a tractor, thereby making it possible to apply certain insecticides with the cultivating operation. The tractors have also made it possible for cotton growers to use shredders, strippers, mechanical harvesters, and larger and better plows, all equipment that helps directly and indirectly in the control of the pink bollworm and the boll weevil.

In some soil types and at high temperature the dust mulch resulting from cultivation may aid in destroying boll weevil grubs in the fallen squares that are exposed to direct sun.

The flaming operation for weed control is of questionable value in insect control.

Mechanical cotton pickers appear to have no direct effect on insect control, except that they require chemical defoliation, which has definite value in insect control. Cotton strippers have an influence on pink bollworm control, for the infested bolls are collected and transported to gins so that any pink bollworms in the seed or refuse may be more easily destroyed.

Cotton stalk shredders not only destroy certain insects, particularly pink bollworms, but are of special value in enabling the cotton growers over wide areas to have the cotton stalks destroyed before frost, thus stopping the development of late generations of the boll weevil and the pink bollworm. Shredders also destroy the food and hiding places of these insects.

Fumigation of mechanical cotton pickers and strippers moving from pink bollworm infested areas to noninfested areas is required by quarantine regulations.

Cotton Insects

• **Bean Thrips**—The bean thrips, **Hercothrips fasciatus** (Perg.), is a common midseason pest of cotton in parts of California. DDT at 1 pound or toxaphene at 2 to 3 pounds per acre gives satisfactory control when applied as either sprays or dusts. (See Thrips on Seedling Cotton.)

• **Beet Armyworm**—The beet armyworm **Laphygma exigus** (Hbn.), commonly attacks seedling cotton plants and occasionally older plants in the western part of the Cotton Belt. DDT at the rate of 1 to 1.5 pounds and toxaphene at the rate of 2 to 4 pounds are effective controls for this insect.

• **Boll Weevil**—Variations in the effectiveness of insecticides approved for control of the boll weevil, **Anthonomus grandis Boh.**, have been observed in local areas across the Cotton Belt. The choice

Control Is a Job For Everybody

By W. P. LANIER

President, Georgia Cottonseed Crushers Association

■ THE GEORGIA cottonseed crushers are vitally interested in cotton insect control because a larger yield of cotton will make more seed available to the oil mills. One of the ways to increase the yield is to control the insects. The success of an insect control program depends to a large extent upon the farmers' knowledge of the pests and proper methods for controlling them.

The Georgia crushers cooperate with the recognized agricultural authorities in working on insect problems. Some of our work includes the distribution of insecticides and official recommendations for their proper use as well as supplemental educational literature. We also recognize the importance of bankers, merchants, farm implement dealers and other local and community leaders who are usually in a position to stimulate a great deal of interest in the program because of their influence upon and direct interest in the welfare of the farmers.

of insecticides will be determined by their effectiveness in the particular area where the insect is to be controlled. Insecticides that have effectively controlled the boll weevil in one or more areas are as follows:

Insecticide	Type of Application	Pounds of Active Ingredient per acre
Aldrin	Spray or dust	0.25 to 0.75
BHC (gamma isomer)	Spray or dust	0.3 to 0.45
Calcium arsenate	Dust	7 to 10
Chlordane	Spray or dust	1 to 1.5
Dieldrin	Spray or dust	0.15 to 0.5
Heptachlor	Spray or dust	0.25 to 0.75
Toxaphene	Spray or dust	2 to 3

However, when these insecticides are used for late-season boll weevil control, other insect problems have to be considered. Infestations of the cotton aphid, the bollworm, and/or spider mites may develop when some of these insecticides are used alone. The bollworm and the tobacco budworm are the principal insects to reckoned with in this category, and because of the danger of their rapid build-up, DDT should always be formulated with aldrin, BHC, chlordane, dieldrin, and heptachlor. (For rates see under the respective insecticides.) Calcium arsenate and toxaphene will sometimes control bollworms without the addition of DDT, but when they are used alone during the late season, careful check at 3- to 5-day intervals should be made to determine the presence of these insects. If their numbers are found to be increasing, DDT should be included in subsequent applications or separate applications of DDT alone should be made.

Aphids may build up rapidly after the use of calcium arsenate or DDT, or aldrin, chlordane, dieldrin, heptachlor, and toxaphene when formulated with DDT. Spider mites may build up rapidly after the use of aldrin, BHC, chlordane, dieldrin, heptachlor, or toxaphene either when used alone or with DDT. Careful checks at 5- to 7-day intervals should be made to determine the presence of these pests, and if found to be increasing, appropriate control measures (see section under "Aphids" and "Spider Mites") should be started at once.

Insecticides should be applied for boll weevil control when definite need is indicated. Except where early season control measures are practiced, insecticides should be applied at intervals of 4 to 5 days until the infestation is brought under control. Fields should be inspected weekly thereafter and applications made when necessary.

• **Bollworms** — The bollworm, **Heliothis armigera** (Hbn.), and the tobacco budworm, **H. virescens** (F.), are the common bollworms attacking cotton. The tobacco budworm is the predominant species in many collections of bollworms from cotton, particularly in the eastern part of the Cotton Belt. Several other species of lepidopterous larvae that sometimes also cause boll injury are discussed elsewhere.

It is sometimes a difficult task to control bollworms and many erratic results have been reported. Effective bollworm control depends on the thorough and timely use of properly formulated insecticides. Frequent field inspections to determine the presence of eggs and young larvae during the main fruiting period of cotton in any given field are essential. It is too late for effective control after the larvae have already entered the squares and bolls.

The most effective insecticide for bollworm control is DDT. For heavy bollworm infestations it should be applied at the rate of 1 to 1.5 pounds of the technical material per acre in a 10 percent dust or concentrated spray. DDT may be used in mixtures with other insecticides where other insects as well as bollworms require control. It is compatible with lime-free calcium arsenate, but not with regular calcium arsenate. Bollworms usually are controlled where 0.5 pounds or more of DDT per acre is applied with BHC, aldrin, chlordane, dieldrin, or heptachlor in the regular schedule for boll weevil control.

Toxaphene, at the rate of 2 to 4 pounds of the technical material per acre, is the next most effective insecticide against bollworms. This may be applied as a 20 percent dust or as a spray. The addition of DDT to toxaphene dust or spray greatly improves the effectiveness of this insecticide for bollworm control.

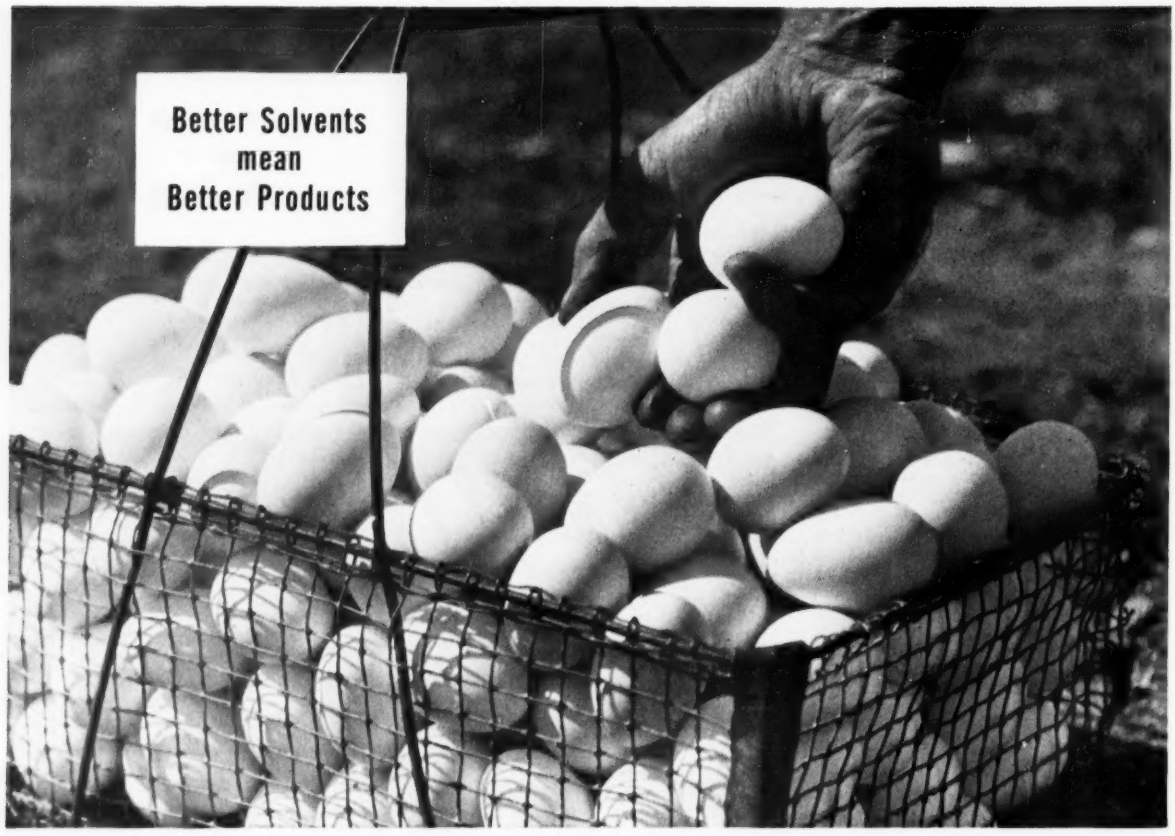
Calcium arsenate and cryolite dusts are less effective.

In areas where spider mites are a problem, dust mixtures containing organic insecticides used for the control of bollworms should include 40 percent of sulfur or an appropriate amount of some other suitable miticide.

• **Cotton Aphid**—Heavy infestations of the cotton aphid, **Aphis gossypii** Glov., often occur on cotton after the use of certain insecticides. Infestations also may be severe on seedling cotton where no insecticides have been applied.

The following treatments, when used in the boll weevil area, will usually prevent an aphid build-up:

1. A dust mixture containing 3 per-



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cent of the gamma isomer of BHC and 5 percent of DDT in every application at the rate of 10 to 12 pounds per acre.

2. A dust mixture containing 3 percent of the gamma isomer of BHC and 5 percent of DDT at the rate of 10 to 12 pounds per acre in alternate applications with calcium arsenate.

3. Nicotine 2 percent in regular calcium arsenate dust at the rate of 10 to 12 pounds per acre alternated with calcium arsenate alone.

4. Parathion 1 percent in lime-free calcium arsenate dust, or 1 percent in dust or 0.1 pound per acre in spray added to aldrin plus DDT, dieldrin plus DDT, heptachlor plus DDT, or toxaphene plus DDT will effectively control the cotton aphid when any of these mixtures are used at the recommended rate for boll weevil control. However, parathion should be used only by those who are qualified to handle such a dangerous material.

5. Toxaphene at the rate of 2 to 3 pounds of the technical material per acre in every application (where toxaphene is not formulated with DDT), either as a dust or spray.

When heavy infestations of the cotton aphid occur and the need for rapid kill is indicated, the following treatments are effective. Heavy reinfestations are likely to recur in some areas in about 2 weeks after the use of BHC, parathion, and TEPP.

1. BHC applied either as a dust or spray to give 0.3 to 0.45 pound of the gamma isomer or an equivalent amount of lindane per acre.

2. Parathion applied either as a dust or spray at a rate of 0.1 to 0.25 pound per acre of technical material.

3. Nicotine 3 percent in hydrated lime dust applied at the rate of 10 to 15 pounds per acre.

4. TEPP 40 percent applied in a spray at the rate of 0.5 pint, or its equivalent, per acre. The effectiveness of this material is of short duration.

5. Systox applied as a spray at a rate of 0.25 to 0.5 pound per acre.

• **Cotton Fleahopper**—The cotton fleahopper, **Psallus seriatus** (Reut.), can be controlled with the following dusts applied at the rate of 10 pounds per acre: DDT 5 percent, toxaphene 10 percent, dieldrin 1.5 percent, aldrin 2.5 percent, heptachlor 2.5 percent, and BHC (gamma isomer 1 percent), and chlordane 2 percent. When spider mites are likely to be a problem, 40 percent or more of sulfur or an appropriate amount of some other suitable miticide should be added to organic insecticide formulations.

The following materials applied as low-gallonage sprays at the rates indicated per acre will give good control of the cotton fleahopper; 0.5 pound of DDT, 1 pound of toxaphene, 0.5 pound of toxaphene plus 0.25 pound of DDT, 0.1 pound of dieldrin, 0.2 pound of aldrin, 0.2 pound of heptachlor, or 0.5 pint of 40 percent TEPP.

• **Cotton Leaf Perforator** — The cotton leaf perforator, **Bacculatrix thurberiella** Busck, is at times a serious defoliator of cotton in certain areas of southern California and Arizona. It is easily controlled with DDT at the rate of 1 pound per acre.

• **Cotton Leafworm** — The cotton leafworm, **Alabama argillacea** (Hbn.), has been controlled successfully for many years with calcium arsenate, paris green or lead arsenate. Effective control is obtained with 20-percent toxaphene dust applied at the rate of 10 pounds per acre

or at 1.5 pounds per acre applied as a spray. Toxaphene-DDT mixture applied as a spray at the rate of 1 pound of toxaphene and 0.5 pound of DDT per acre, or parathion applied at the rate of 0.125 pound per acre as a dust or spray is also effective. When following a regular program for control of other cotton insects, dust formulations containing 3 percent of the gamma isomer or 3 percent of the gamma isomer plus 5 percent of DDT applied at 10 pounds per acre and BHC-DDT spray applied at the rate of 0.3 pound of the gamma isomer and 0.5 pound of DDT per acre have given effective control.

• **Crickets**—Several species of crickets sometimes attack cotton. The field cricket, **Acheta assimilis** F., occasionally feeds on cotton bolls and seedling plants in the Imperial Valley of California. They may be controlled with dusts containing 10 percent of DDT or 5 percent of chlordane applied at the rate of 20 to 25 pounds per acre. The dust containing 2 percent of BHC plus 5 percent of DDT plus 40 percent of sulfur is also effective.

• **Cutworms**—A number of species of cutworms, including the following, may develop in weeds or crops, especially legumes: Black cutworm, **Agrotis ypsilon** (Rott.); pale-sided cutworm, **Agrotis malefida** Guen.; variegated cutworm, **Peridroma margaritosa** (Haw.); granulate cutworm, **Feltia subterranea** (F.); army cutworm, **Chorizagrotis auxiliaris** (Grote).

Cutworms migrate to adjacent cotton or attack cotton planted on land previously in weeds or legumes.

Recommended control measures include thorough seed-bed preparation, elimination of weed host plants, and the use of insecticides. In western areas, irrigation of the fields forces the subterranean forms to the surface, where they may be treated with insecticides or destroyed by natural factors. If the need for insecticides to save the stand is to be avoided, at least 3 weeks should elapse between the time an infested area is plowed under and the subsequent cotton crop is seeded. Toxaphene and toxaphene-DDT sprays applied at a rate of 2 to 3 pounds per acre, DDT and heptachlor sprays at 1 to 15 pounds per acre, and dieldrin at the rate of ⅜ to ½ pound per acre are effective. Twenty percent toxaphene or 10 percent DDT dusts applied at rates of 10 to 15 pounds per acre will give satisfactory control. Poison baits containing paris green, cryolite, sodium fluosilicate, toxaphene, or DDT have been satisfactory. A bait containing 80 percent of bran, 11 percent of oil, and 8 to 9 percent of a 25 percent emulsifiable DDT applied at the rate of 15 to 20 pounds per acre has given effective control.

• **Fall Armyworm**—The fall armyworm, **Laphygma frugiperda** (J. E. Smith), occasionally occurs in sufficient numbers to damage cotton. The following dusts have given good control: Toxaphene 20 percent at the rate of 10 to 15 pounds per acre, sufficient BHC to give 3 percent of the gamma isomer plus 5 percent of DDT at the rate of 10 to 15 pounds per acre, chlordane 10 percent at the rate of 15 to 20 pounds per acre, or DDT 10 percent at the rate of 10 to 15 pounds per acre. A 5-percent DDT dust will control small worms. Toxaphene at the rate of 2 to 2.5 pounds per acre on DDT applied at the rate of 0.5 to 1 pound of the technical material per acre in sprays have given good control. Other insecticides that have been effective when applied as sprays are dieldrin 0.15 to 0.30 pound of technical material per acre, BHC containing 0.40 to 0.60 pound of gamma isomer per acre, and aldrin 0.25 to 0.50 pound of technical material per acre. The results obtained from the above materials have varied in different states, therefore, local recommendations are advisable. (Also see Bollworms.)

• **False Wireworms**—Larvae of darkling ground beetles belonging to the genera **Blapstinus** and **Ulus** occasionally affect the stand of young cotton in the western areas. They may be controlled by slurrying 2 ounces of lindane onto each 100 pounds of planting seed. On young cotton plants they may be controlled with 5-percent chlordane dust applied at the rate of 20 pounds per acre, or with toxaphene, DDT, or a toxaphene-DDT 2 to 1 mixture applied as sprays at the rate of 1 to 2 pounds of technical material per acre.

• **Garden Webworm**—The garden webworm, **Loxostego similalis** (Guen.), may be controlled on cotton by dusts containing 5 percent of DDT plus sufficient BHC to give 3 percent of the gamma isomer, 20 percent of toxaphene, 1 percent of parathion, or 10 percent of DDT. Good control of this insect may be obtained with toxaphene, toxaphene plus DDT, DDT, heptachlor, and dieldrin sprays. DDT has given better control in sprays than in dusts and is generally less effective than the other listed materials. Calcium arsenate may also be used to control the garden webworm, but heavy dosages are required and control is generally less satisfactory than with the new organic insecticides.

• **Grasshoppers** — Several species of grasshoppers attack cotton, particularly the differential grasshopper, **Melanoplus differentialis** (Thos.) and the American grasshopper, **Schistocerca americana** (Drury). The adults of **S. americana** hibernate and deposit their eggs in the fields, but most other species overwinter in eggs in untilled soil, in fence rows, sod waterways, around stumps, and in similar locations. The overwintering species can best be controlled by early treatment of hatching beds before the grasshoppers migrate into the fields. Sprays or dusts containing aldrin, chlordane, heptachlor, dieldrin, toxaphene, or BHC are rapidly replacing poison baits for grasshopper control in many areas. This is particularly true where grasshoppers must be controlled on lush or dense vegetation.

BHC sprays and dusts usually kill the grasshoppers in a few hours, but results have been erratic and residual effectiveness is limited to 1 or 2 days. Aldrin, chlordane, dieldrin, and toxaphene are very effective but slower in their action. However, they remain residually effective for 5 to 14 days, depending on prevailing environmental conditions.

Dosages suggested to control grasshoppers fall within the following ranges:

	Pounds of technical material per acre
Aldrin	0.1 to 0.25
BHC, gamma isomer	0.3 to 0.5
Chlordane	0.5 to 1.5
Dieldrin	0.07 to 0.125
Toxaphene	1.0 to 2.5
Heptachlor	0.25 to 0.5

The lowest dosages suggested are effective against newly hatched to half-grown grasshoppers. The dosage should be increased as the grasshoppers mature or when the materials are applied on partly defoliated plants or on plants unpalatable to the insects.

Baits made according to state and federal recommendations still have a place in grasshopper control where treatment of extensive areas is required, particularly in sparse vegetation.

• **Lygus Bugs and Other Mirids**—The tarnished plant bug, **Lygus lineolaris** (P. de B.); the other lygus bugs, **L. hesperus** Knight and **L. elisus** Van D.; the rapid plant bug, **Adelphocoris rapidus**

Advises Farmer to Poison as Needed

By M. W. TILGHMAN
President, The Carolinas Ginners Association

■ THE VALUE of a planned, intelligent insect control program cannot be stressed too greatly.

When needed, consistent dusting or spraying of cotton with recommended insecticides at regular intervals will bring about maximum results; whereas, irregular applications will not, as the infestation has sufficient time to build up during the intervals. The greater the infestation the less chance there is of bringing about satisfactory control. At the same time it is needless to poison if there is little or no infestation.

My advice to growers is to learn to take an infestation count, so they will know when they need to apply insecticides. When growers have sufficient infestation to warrant application of insecticides, then it should be done at regular planned intervals and in the correct amounts, so that maximum results will be attained.

The more effcient an insect control program is, the more efficient the results will be and the less the cost.

(Say); the superb plant bug, **A. superbus** (Uhler); **Creontiades debilis** (Van D.); **C. fermoralis** (Van D.); **Neurocolpus nubilis** (Say); and the ragweed plant bug, **Chlamydatus associatus** (Uhl.) are a complex of related plant bugs which cause damage to squares and small bolls of cotton. This group is a major problem, particularly in the irrigated regions of the West. DDT at the rate of 1 to 1½ pounds per acre is the preferred insecticide for the control of these insects. The other organic insecticides recommended for boll weevil and bollworm control are also effective against these bugs.

• **Pink Bollworm** — Weather conditions favorable for survival of the pink bollworm, **Pectinophora gossypiella** (Saund.), coupled with failure to carry out known effective cultural practices, have resulted in an alarming increase in the infestation and a much wider spread of this insect during the last 3 years. Damaging infestations occurred throughout southern Texas during the 1952 season. **In some of the fields over 90 percent of the crop was destroyed by the pink bollworm.** The rapid spread and build up in the pink bollworm population emphasizes the need of developing control measures that can be readily carried out under all weather conditions.

To suppress the pink bollworm and to prevent its artificial spread all cottonseed should be sterilized by either heat treatment or methyl bromide fumigation. All lint should be compressed before it is moved into noninfested areas. Gin waste should be destroyed promptly by burning, or when used as a fertilizer, by composting or by heat treatment. Mechanical cotton pickers that have been operated in an infested area should be fumigated with methyl bromide before they are moved into a noninfested or lightly infested area. The cotton growers in such areas should examine the picking sacks and other personal effects of migrating cotton pickers and burn all seed cotton found.

There are a number of cultural practices that are helpful in reducing the pink bollworm infestation during the growing season. One of the first steps is to plant seeds that are free of infestation. Since there is a progressive build up in the pink bollworm population as the season advances, every effort should be made to expedite fruiting and setting the crop. The following practices are recommended for hastening the maturity of the cotton and thereby reducing the pink bollworm infestation: Early uniform planting of quick-maturing varieties; control of cutworms, thrips, cotton fleahoppers, boll weevils, and other insects that delay fruiting; clean cultivation; elimination of late irrigation; and chemical defoliation.

Crop losses from the pink bollworm can be reduced by the proper use of insecticides. DDT or a mixture of DDT with EPN are the most effective materials for its control. The DDT should be applied either as a dust or as a spray at the rate of 2 to 3 pounds of technical DDT per acre at weekly intervals. The mixture of DDT with EPN should be applied at the rate of 0.5 pound of EPN with 1.5 pounds of technical DDT per acre at weekly intervals. Where other insects as well as the pink bollworm require control, the DDT can be mixed with other insecticides. When the interval of application is reduced to 4 or 5 days for control of other insects, the quantity of DDT may be reduced accordingly or to the rate of 1.5 to 2 pounds per acre in combination with the other insecticides. DDT is compatible with other organic insecticides and with lime-free calcium arsenate. It may be mixed with regular calcium arsenate if used immediately afterwards, but the mixture should not be stored. Thorough coverage of the cotton plants with the insecticide is essential in the control of the pink bollworm.

Most of the pink bollworms are carried over from one crop year to the next in the bolls and locks of cotton that are left in the field. This overwintering population can be greatly reduced by proper cultural practices. In mild humid regions, such as southern Texas, the stalks should be cut immediately after the cotton is harvested. The best procedure is to cut the stalks with one of the new-type shredder cutters. These machines kill many of the pink bollworms during the process of shredding the stalks. They also shatter and spread the bolls on the surface of the soil, which permits a more thorough coverage of the debris when the land is plowed. In hot, dry weather a high percentage of the pink bollworms in the bolls and locks of cotton exposed on the ground are killed by the soil-surface temperature. Weather conditions permitting, plowing under the debris should therefore be delayed until about a week after the stalks are cut. During plowing every effort should be made to cover the debris as deeply as possible. Pink bollworm survival is six times higher in bolls buried only 2 inches deep than in bolls buried 6 inches deep. All sprout and seedling cotton developing after the

(Continued on page 80)

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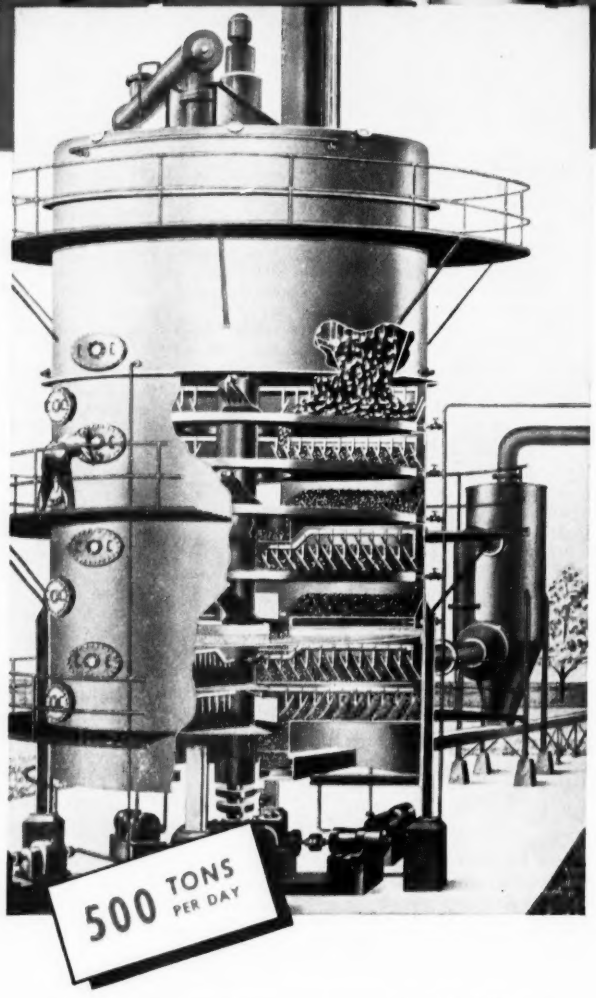

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• Rio Grande Valley Prospects Better

The planting season has been good enough to cause cotton farmers in the Rio Grande Valley, Texas, to hope for a good crop this year, according to Frank Brunneman, Cameron County Agent. On March 3 Brunneman said that from 60 to 65 percent of the cotton acreage had been planted and that most of it had sprouted. Almost everyone who had not already planted cotton at that time, and who expected to do so, planned to plant it during the first week in March.

The Valley entered the spring with more moisture than last year, which was one of the worst drouth years in many seasons, and the rain that has fallen has been soaked up by well-cultivated fields that were prepared for cotton or vegetables, the County Agent said. General opinion is that most areas in the Vallley have enough moisture to keep cotton going for nearly a month without additional rain.

There is still much concern in irrigated areas about the low water level in the Rio Grande River and without more rain this spring and early summer there is some pessimism over the outcome of the cotton crop, even though it is off to the best start in several years, Brunneman said.

Substantial Linters Sales Reported by USDA

USDA reported March 4 that substantial quantities of cotton linters have been sold under the sales program announced Feb. 6. Under this program, Commodity Credit Corporation stocks of cotton linters are offered for sale each week, on an offer-and-acceptance basis. USDA also announced, as an aid to buyers in preparing future offers, that no offer to purchase chemical linters will be accepted if the price offered reflects less than five cents per pound basis 73 percent cellulose, with premiums and discounts of six points for each one percent above or below 73 percent.

Offers will continue to be received until noon each Monday at the PMA commodity offices at New Orleans, Dallas and San Francisco, with acceptance or rejection by the close of business the following Wednesday. In the future, all announcements of sales, together with names of purchasers, will be made by the respective PMA commodity office accepting the offers to buy.

Benson Appoints Peanut Advisory Committee

A special peanut price support advisory committee, representing producers, shellers and handlers, has been appointed by Secretary of Agriculture Ezra Taft Benson. The committee will study the current peanut support program and advise regarding methods of operation for the 1953 crop. It held its initial meeting in Washington March 9.

Committee members are J. Mayon Parker, Ahoskie, N. C.; J. D. Sargent, Tolar, Texas; S. E. Statham, Cobb, Ga.; H. G. Blalock, Richmond, Va.; John I. Taylor, Oklahoma City, Okla.; H. L. Wingate, Macon, Ga.; Walter L. Randolph, Montgomery, Ala.; Edward F. Gilliam, Suffolk, Va.; Earl Watts, Konawa, Okla.; and Roy Parrish, Moultrie, Ga.

New Folder:

DESCRIBES HOWE LINE OF MOTOR TRUCK SCALES

An eight-page two-color folder (Form No. 678) just released, illustrates and describes the complete line of modern, heavy-duty Howe Four-Section Straight Lever Ball-Bearing Motor Truck Scales for weighing big truck and trailer loads.

The folder reviews and illustrates many exclusive Howe features including the renowned ball-protected bearings, "Inside" antifriction plates and other construction details.

Complete specifications and pit dimensions are listed. The Howe Four-Section Straight Lever Motor Truck Scale has a capacity of 50 tons. Platform sizes are 45, 50, or 60 feet long by 10 feet wide.

The folder also describes a most complete line of weight indication offered with these scales including: the Full Capacity Beam, Type Recording Beam, Balance Indicator, the exclusive Model 77-D and Cabinet Weightographs, the unique Tape-Drive Cabinet Dials, and the Howe Teleprint Electronic Remote Weight Recorder.

For further information, write for a free copy of Form No. 678, The Howe Scale Company, Rutland, Vermont.

Margarine Output Drops

Total margarine production in January was 126,580 pounds compared with 128,145 pounds in January, 1952, Bureau of Census reports show. Colored margarine production was 118,621 pounds compared with 111,477 a year earlier.

• Maid of Cotton on European Tour

MAID OF COTTON Alice Corr flew to Paris March 14 for a tour of Europe that will include appearances in France, Holland, Italy and England at the invitation of the cotton textile industries of those countries.

Announcing her itinerary, the National Cotton Council said Miss Corr's 18-day European tour will be the most extensive ever undertaken by a Maid of Cotton. For the first time, the Maid of Cotton will include Italy and Holland on her itinerary; she will also be the first to visit England since 1950.

A special Liaison Committee representing the cotton textile industries of Belgium, France, West Germany, Great Britain, Holland, Italy, Sweden and Switzerland resolved at a meeting in Paris last Dec. 6 to request an extensive Maid of Cotton tour as part of a cotton promotional program being developed by participating countries.

Miss Corr will show her 42-piece wardrobe, representing the cream of American fashions, to textile and style leaders in Western Europe. Forty ranking American designers joined in creating her costumes.

Five Paris couturiers will provide additional outfits reflecting the best in French styles. American cotton fabrics for these costumes already have been flown to designers Pierre Balmain, Hubert de Givenchy, Jacques Heim and Serge Kogan in Paris.

After four days in Paris, she will fly to Amsterdam March 19 for a three-day visit to Holland. She will be a guest of honor at the annual Netherlands Textiles Fair in Utrecht March 20.

Returning to Paris March 22, she will take a sightseeing trip arranged by the French Government Tourist Bureau, visiting historic chateaus of the Loire countryside south and west of Paris.

The green-eyed Alabama beauty will fly to Italy for appearances March 26 and 27 and will return to Paris March 28. She will appear in Manchester, center of the British cotton textile industry, on March 29 and 30, returning to Paris on March 31.

Her flight home via Air France will land her in New York April 2, in time to prepare for the Easter Parade.

The Maid of Cotton, who is currently touring the West Coast, will have appeared in 15 cities before flying to Europe. Her six-month tour started Feb. 2 in Miami.

Upon her return from Paris, she will visit 15 more cities in a second cross-country tour, after which she will travel to Canada and South America in June and July.

• Waits 50 Years to Sell His Cotton

HAYNES P. SMITH, Spartanburg, S. C., waited 50 years to sell three bales of cotton, but he got a better price by waiting. Cotton was selling for about five cents a pound in 1902 when three bales of Smith's cotton were ginned, so he decided to wait for a better market.

The cotton brought 35 cents a pound when it was sold Feb. 24, 1953, to F. L. Burnett, Spartanburg. The cotton had been kept in a house on the farm since it was ginned.

Delta Council Urges Cut In 1953 Lint Acreage

The need for a reduction in cotton acreage across the Belt in 1953 to avoid the building up of a burdensome surplus was reviewed March 3 by members of the Delta Council executive and agricultural committees meeting at Stoneville, Miss.

With cotton farmers facing almost certain acreage controls next year, the committees recommended action to stimulate a voluntary reduction of acreage as an approach to the problem. The committtees pointed out that the huge increase in cotton acreage in 1951 and 1952 was made at government request to meet defense goals. Farmers who have geared their operations to a high level of production cannot make the necessary shifts in one year to reduce the cotton acreage in line with the recommended level of production without incurring out-of-proportion risks.

The committees recommended legislation to provide that farmers who cooperate with the Secretary of Agriculture's recommendation by reducing their cotton acreage in 1953 to a level consistent with a national production of 12.5 million bales would receive a support price on their 1953 crop of 100 percent of parity. It was pointed out that if such a reduction could be made, the market price for the 1953 crop would be above loan level and the major portion of the crop would move into normal market channels without recourse to the loan.

Unanimous endorsement was also given to the Abernethy Bill introduced in the House of Representatives by Congressman Thomas G. Abernethy to permit farmers to join together in efforts to reduce acreage and promote orderly marketing without the threat of antitrust action.

Acting on a letter from the State Plant Board, the Committees recommended that the Board enforce present regulations controlling the application of 2,4-D from aircraft. The regulation provides that 2,4-D cannot be applied by aircraft within one mile and one-half of cotton. Committee members expressed the view that 2,4-D should not be allowed in aircraft during the cotton growing season.

Action was taken by the group endorsing the Extension Service program of balanced farming. The program was presented by L. H. Moseley, Northwest District Extension Agent.

Moseley urged Delta farmers to reduct their risk by planting cotton only on well adapted cotton land and using the remaining acres for soybeans, pastures, small grains and other crops. High production per acre was listed as the best and surest method of reducing costs.

Other action taken by the group included a recommendation that Delta farmers follow Experiment Station and Extension Service advice on fertilizer practices; a request to Congress for extension of Public Law 78, which provides for the importation of Mexican National farm workers, and opposition to the transfer of the Farm Labor program to USDA.

■ **HENRY W. MEYERHOFF, Kansas City manager, Fulton Bag & Cotton Mills, has been elected president of the Kansas City Feed Club.**

Set Limits on Oil and Lard Futures Trading

USDA has announced the establishment, by the Commodity Exchange Commission, of limits on speculative trading in cottonseed oil, soybean oil and lard futures. The limits become effective April 1.

Under the Commodity Exchange Act, the Commission, consisting of the Secretary of Agriculture, the Secretary of Commerce, and the Attorney General, is authorized to fix limits, after due notice and hearing, on the amount of speculative trading by any person in any commodity covered by the act.

With certain exemptions for cottonseed and soybean processors, the maximum net long or net short speculative position which any person may hold or control in any one future or in all futures combined, on any one contract market, is as follows: cottonseed oil, 3,600,000 lbs. (60 contract units); soybean oil, 3,000,000 lbs. (50 contract units); lard, 1,600,000 lbs. (40 contract units).

These amounts are also fixed as daily trading limits—the maximum which any person may buy or sell speculatively in any one future or in all futures combined, on any one contract market, during one business day.

Presenting

A. S. Campbell

Webb, Miss.

A. S. CAMPBELL, Webb, Miss., was born Sept. 13, 1878, at Kosciusko, Miss., and entered the cotton oil mill business in 1902 with the Union Oil Co. at Shreveport. He moved to Torras, La., with the same firm the following year. In 1916 he became cashier and bookkeeper for the Webb-Sumner Oil Mill, Sumner, Miss., and in 1920 moved two miles to Webb, his present location. In 1925 he became manager of the mill, now the Tallahatchie Oil Mill, when it was purchased by Planters Mfg. Co., Clarksdale.

Campbell served as president of the Mississippi Cottonseed Crushers Association in 1951-52, is a past president of the Sumner Rotary Club and served several years as an alderman for the town of Webb. He is an elder in the Sumner Presbyterian Church.

• Jackson Gives Views To Arizona Group

COTTON has made its most dramatic gains in these recent years when the synthetics with their new and glamorous appeal were having their most enthusiastic acceptance," said Robert C. Jackson, Washington, executive vice-president, American Cotton Manufacturers Institute, before a meeting of the Arizona Cotton Producers Association in Phoenix recently.

Jackson pointed out that cotton is more than twice as important as all other fibers combined in terms of total consumption. Cotton mills are expected to use 9½ million bales this year. Cost of raw cotton, the ACMI official stated, is about one-half of the mill selling price for gray goods. "Few if any" manufactured products in America have a raw material cost content equal to cotton goods, he added.

He reminded listeners that cotton has to meet competition from paper and plastics as well as from synthetic fibers. New ways of meeting all of this competition, he stressed, are being developed and put into practice.

New Mexico Cotton Insects Subject of New Bulletin

Hemipterous insects—those which suck plant fluids—are the subject of a New Mexico Experiment Station bulletin, "Hemipterous Insects," by L. R. Faulkner, assistant entomologist. The bulletin tells when these important insects are most likely to attack and the time of the season when they are most likely to damage cotton.

According to the bulletin, in both the Mesilla and the Pecos Valleys, Lygus bugs and two species of the black cotton fleahopper were more abundant than the other Hemipeterous insects. The largest numbers of these pests were found early in the season, and that is when they are most likely to damage cotton.

Lygus bugs are likely to be more of a problem in the Mesilla Valley than in the Pecos. The black cotton fleahoppers were found in both valleys at varying times.

The green cotton fleahopper was more abundant in the Pecos Valley, and the greatest damage by this insect can be expected during the first half of the growing season.

The superb plant bug and species of stink bugs were not numerous in either valley during the two-year study; but more of these were found late in the season than early.

Trap screens were used to determine the relative importance of desert vegetation and alfalfa as contributors to population build-up in adjacent cotton fields in 1950. Desert vegetation and alfalfa were equally important in contributing to the build-up of the Lygus species and two species of black cotton fleahopper.

The movement of the green cotton fleahopper into cotton from desert vegetation was not as great at any time as it was from alfalfa. Its migration from desert vegetation, however, covered a longer time. This means that the two sources of population build-up are probably equal.

Copies of the bulletin may be obtained free of charge from New Mexico county Extension agents or from the Experiment Station, State College, N. M.

Latest Soybean Blue Book Has New Information

Latest authoritative information on the soybean crop and industry is presented in the 1953 edition of the Soybean Blue Book, published by the American Soybean Association and just off the press. The book contains 160 pages and cover.

Assembled for quick reference are the latest available statistics on production, prices and utilization of soybeans, mea' and oil, according to Geo. M. Strayer, secretary-treasurer. A number of new tables and graphs are included for the first time this year. There are directories of soybean processors, oil refiners, and manufacturers using soy products in their operations, as well as firms offering their services and products to the soybean industry.

The book is available at $3 per copy from the American Soybean Association, Hudson, Iowa.

S. V. Edens, Retired Mill Superintendent, Dies

Funeral services were held March 6 at Union, S. C. for S. V. Edens, Sr., retired superintendent of the Union Oil Mills. He was a member of Grace Methodist Church and the Woodmen of the World. He is survived by his widow, two daughters, Mrs. Myra Willard and Mrs. Lucile Charles, and a son, S. V. Edens, Jr., all of Union; six brothers and five sisters.

• Southwest's Drouth Still Widespread

THE SOIL CONSERVATION SERVICE has announced results of its new four-state survey of soil moisture and plant cover conditions, reporting that half of Texas and more of Oklahoma on March 1, 1953, remained in the grip of the Southwest's most damaging drouth.

However, Regional Director Louis P. Merrill, Fort Worth, reported that in approximately 140 counties of eastern and central Texas and in some areas of southeastern and north central Oklahoma moisture and cover conditions have improved and, in his opinion, these areas are no longer on the critical list.

In September, following a similar survey, Merrill reported that from the standpoint of area involved, duration, effect on land cover, persistent high temperatures and in the scantiness of effective rainfall the Texas drouth was the worst on record.

"Our new check-up shows that for the most part there has been no relief in the stricken areas," Merrill said. "Fall rains in north central Texas have moved it from the drouth category, and the section immediately north of Haskell, one of the reference points in our drouth study, is improving. However, the Texas Panhandle area now must be added to the area involved. The Amarillo section has had 20 months of poor moisture conditions."

Merrill said the study by his office showed the dry weather duration at eight Texas reference points as follows: Big Spring, 30 months; Del Rio, 38, Falfurrias, 40; Fort Stockton, 28, Lubbock, 34½; Haskell and San Angelo, 29; and Amarillo, 20 months.

• **Worst on Record**—The average duration of the drouth at these points is 31 months. The 1933-36 drouth in Texas lasted 24.4 months and the one in 1916-18 ran 24 months. The sketchy information gathered by historians on the 1885-87 drouth indicates that dry period, though intense and costly, lasted only 23 months. The current drouth did not hit Oklahoma until June of last year.

In 83 counties of the wheat-growing areas of Texas and Oklahoma the winter cover crop is in poor or only fair condition. In Cimarron County of the Oklahoma Panhandle, for example, wheat on 50,000 acres of the 100,000 acres planted to this crop last fall did not come up. These 50,000 acres have been chiseled to prevent soil blowing. The wheat on 30,000 acres is thin and spotty. On the remaining 20,000 acres it is only fair.

The wheat cover in Hansford, Ochiltree and Lipscomb counties in the topmost tier of the Texas Panhandle is small and thin and beginning to turn yellow for want of moisture. Only a timely rain can save the crop in these counties, field reports to Merrill said. Other Texas counties reporting wheat cover in poor condition included Donley, Tom Green, Sterling, Glasscock, Hutchinson, Callahan, Runnells, Concho, Menard, Moore, Deaf Smith, Oldham, Carson, Yoakum, Terry, Lynn, Borden, Scurry, Schleicher and Kendall.

Reports to Merrill said that other Oklahoma counties where the wheat cover is in poor condition included Beaver, Texas, Harper, Ellis, Woodward, Major, Woods, Oklahoma, Caddo, Seminole, Garvin, Greer, Pushmataha, Washita, Muskogee, Beckham, Kiowa, Kingfisher, Okfuskee, Love, Hughes, Pottawatomie, McClain and Tillman.

• **Cattlemen Hard Hit**—Cattle are wintering in many parts of Texas and Oklahoma in fair to weak conditions, Merrill reported. Where they are in fair condition in the dry areas, he added, it has been only been because of heavy feeding, an added expense that has severely pinched many stockmen financially, and because of mild weather.

Livestock herds in the dry areas of Oklahoma and Texas have been further reduced as the drouth has cut deeper into ranges and pastures, reports to Merrill showed. In Maverick County of Southwest Texas, where cultivated land is under irrigation, the cattle wintered in fair condition but this was because only 25 percent of the normal animal population remained and they have been on feed for some time. Seventy-five percent of the normal cattle population had been sold off or shipped to other areas for pasturage. In Irion and Reagan counties of Texas 90 per cent of the cattle and 80 percent of the sheep herds had been sold or shipped out. Stockmen in Howard, Martin, Borden, and Scurry counties had sold or shipped out 80 percent of their cattle.

Eighty percent of the normal cattle population of Pottawatomie County in Oklahoma and two-thirds of the cattle of Greer County have been sold or shipped away, Merrill said his field reports showed. Oklahoma counties in which cattle herds have been reduced by 25 percent or more because of the drouth include Nowata, Seminole, Greer, Grant, Tillman, Pushmataha, Washita, Muskogee, Arbuckle, Kiowa, Kingfisher, and Sequoyah.

Water supplies for livestock in areas having wells are adequate and in no immediate danger, Merrill said, but in some areas where stockmen depend on surface supplies, the source has dried up and water is being brought in.

Rains Help Dry Areas But More Needed

Editor's Note: Rains over much of Texas since March 1 have greatly helped the moisture situation, but more rain is needed to replenish stock water and city water supplies. Arkansas and Louisiana now have adequate soil moisture in most areas, and much of Oklahoma has had beneficial rains. However, more rainfall and months of favorable weather will be required to offset the drouth conditions described in the accompanying article.

Kenneth O. Lewis Named NCPA Representative

An experienced young agricultural and livestock leader, Kenneth O. Lewis, has been appointed Western Field Representative for the Educational Service of the National Cottonseed Products Association according to Director A. L. Ward.

"Lewis' understanding of farm and livestock problems and his work with both feeders and cotton producers make him especially well qualified for his work with the cottonseed crushing industry," Ward said in announcing the appointment.

KENNETH O. LEWIS

"We are especially pleased with Lewis' well-balanced training and experience. He understands both the practical and the scientific aspects of modern crop and livestock production."

His early childhood was spent on a cattle ranch. As a 4-H Club member, he selected and fed show steers under the direction of one of the Southwest's best known showmen. Later, he spent his college summer vacations in training on the famous Pitchfork Ranch under Manager D. Burns who was one of the first fieldmen ever employed by the Educational Service.

Lewis is a 1947 graduate of the Texas Technological College with a degree in animal husbandry. While a student in college he was a member of the livestock judging teams and participated in judging events at the American Royal and International livestock shows.

He has had two tours of active duty with the United States Air Force. During World War II he served as 1st Lt. Pilot in Europe. Discharged from the Service in 1946, he was recalled to active duty in 1951 and has just completed another 21 months with the Air Force.

Lewis has been connected with the Texas Agricultural Extension Service since his graduation from college. He served as Assistant County Agent at Lamesa, Texas, and as County Agricultural Agent at Jayton, Texas, and Benjamin, Texas.

Director Ward points out that, "His experience in the United States Air Force and as a County Agricultural Agent has developed his leadership ability which is so essential in representing the cottonseed crushing industry with its feed customers, seed producers and industry associates."

McDonald Given Bank Post

The National Bank of Commerce, Memphis, recently announced the appointment of Ernest D. McDonald as assistant to James N. Perkins, vice-president and head of the bank's farm department.

• Meeting Recommends Peanut Research

NINE specific recommendations for research on peanuts were adopted at the recent pearut conference on utilization for edible purposes, held in New Orleans, La., at the Southern Regional Research Laboratory of the USDA Bureau of Agricultural and Industrial Chemistry. Improvement in quality of raw material was stressed repeatedly as the most important problem confronting the different segments of the industry. The research recommendations included:

• **Peanut butter industry.** Two factors regarding the quality of peanuts on which improvement could be made by research were amounts of damaged and shriveled peanuts, and the variations in moisture content of raw stock available to the industry. These problems should be attacked by research on production and harvesting of peanuts, which wiil diminish these difficulties and will result in improved flavor, and by research on improved utilization of byproducts, particularly on uses for peanut kernels undesirable for use in edible peanut products.

• **Nut salting industry.** Emphasis in research should be placed on improving the quality of products by development of better techniques in blanching and deepfat frying operations, and on improving the quality of the raw peanuts to be used by this industry.

• **Over-all industry problems.** Research is needed: To increase the use of peanuts as an oilseed; on production of peanuts of high quality and yield; on development of uses for peanut hulls; and to determine the importance of trace metal content in the keeping quality of peanuts. A survey should be made of existing information on the relation of heat treatment during processing and nutritional value of peanut products.

These recommendations were formulated by three committees whose subjects and chairmen were as follows: Problems in the Manufacture of Peanut Butter, chairman—C. M. Cruikshank, Cinderella Foods, Stevens Industries, Dawson, Ga.; Problems in the Manufacture of Salted Peanuts and Confections Containing Peanuts, chairman — George Gershuny, Peanuts and Nut Salters Association, Newark, N. J.; and Possible Contributions of Basic Research on Peanuts, chairman—A. M. Altschul, Southern Regional Research Laboratory, New Orleans, La.

Adopted at the conference was a resolution that the various peanut trade associations appoint committees to confer with the Southern Laboratory and with other agencies conducting research on peanuts.

Cotton Linters Examiners Schedule Conferences

Conferences on classifying cotton linters according to official U. S. standards have been scheduled for major cities, the Board of Cotton Linters Examiners, USDA, has announced.

Licensed classifiers who wish to have their licenses renewed are expected to attend one of the conferences, and persons other than licensed classifiers are welcome, USDA states.

Victor R. Fuchs, chairman, Board of Cotton Linters Examiners, will be available for consultation at each meeting. The Board points out: "No renewals will be granted until the Board is satisfied that you have maintained a suitable efficiency to warrant recommendation. Consideration will be given to the results of a test in the classification of a limited number of samples, and you are requested to have all records and samples accessible in case you are called upon to produce them for inspection."

Conferences will be held in the following cities beginning at 11 a. m.: Charlotte, N. C., 630 West Eleventh Street, March 19; Atlanta, Ga., 1020 Cresent Avenue, N. E., March 20; New Orleans, La., 940 Perdido Street, March 23; Houston, Texas, 600 Texas Avenue, March 25; Memphis, Tenn., 1328 Monroe Avenue, March 26; Cincinnati, Ohio, by appointment, April 23; Chicago, Ill., by appointment, April 24; Bakersfield, Cal., 430-27th Street, April 28; Los Angeles, Cal., 1422 East Sixth Street, April 29; Phoenix, Ariz., 304 West Indian School Road, May 1; El Paso, Texas, 517 U. S. Court House, May 2; Dallas, Texas, 1104 South Ervay, May 4. The New York-Philadelphia area will be notified when definite dates are set in late June.

■ **JOHN C. RICE, former educational manager, Chilean Nitrate Education Bureau, is now research professor of agronomy at North Carolina State College and director of the North Carolina Crop Improvement Association.**

Classified Advertising

RATES: Ten cents per word, per insertion. Include your firm name and address in count. Minimum advertisement $2.00. Strictly cash basis—enclose check with order. Copy must be in our hands by Thursday morning of week of issue. Write copy plainly.

Oil Mill Equipment for Sale

FOR SALE—One 30" Sprout-Waldron attrition mill, complete with starters. Excellent condition. Priced to sell.—Southland Feed Mills, Box 6666, Dallas, Texas.

OIL MILL EQUIPMENT FOR SALE—Anderson Expellers, French screw presses, cookers, dryers, rolls.—Pittock and Associates, Glen Riddle, Pa.

FOR SALE—72-85" cookers, rolls, formers, cake presses and parts, accumulators-pumps, hull-packers, Bauer No. 153 separating units, bar and disc hullers, beaters-shakers, Carver linters, single box baling presses, filter presses, expellers, attrition mills, pellet machines, pneumatic seed unloader. If it's used in oil mill, we have it.—V. A. Lessor and Co., P. O. Box No. 108, Fort Worth, Texas.

OIL MILL MACHINERY FOR SALE—Everything for hydraulic press rooms—141-saw linters—No. 199 seed cleaner—42" Chandler huller—filter presses—Carver meats purifier—electric motors—screw conveyor and hangers.—Sproles & Cook Machinery Co., Inc., 151 Howell St., Dallas, Texas. Telephone PRospect 5958.

FOR SALE—Complete hydraulic oil mill less buildings. Mill equipped with power, three presses, cookers, formers, cake stripper, cutter and rolls. Cake mill, separating unit, beaters, protein machine, 10 linters, Martin lint handling equipment. Helm saw filer, press box, seed house equipment and oil tanks. Also two cotton gins with or without buildings.—Union Cotton Oil Co., Prague, Okla.

FOR SALE—Special (almost new)—all machinery in 100-ton solvent mill including preparation, meal handling, boiler. Several long barrel French presses and Anderson Superduo Expellers, California pellet mills and other machinery. Write, if we have what you need, can save you money.—L. L. Ford Associates, Greenville, Miss.

OIL MILL MACHINERY FOR SALE—1 French 8 ton high pressure accumulator, 1 French 8 ton low pressure accumulator, 1 French high pressure shock absorber, 6-15 box Davidson-Kennedy hydraulic presses complete with operating valves and gauges, 6-15 box French hydraulic presses complete with operating valves and gauges, hydraulic piping system, 1 Davidson-Kennedy pressure type cooker with 84" charging and seed cookers, 1 Davidson Kennedy cake former, 1 McNutty cake stripper, 1 Bauer Bros. No. 8 cake breaker, 1 French belt drive 4 plunger high and low pressure oil pump. Priced to sell—ready to move.—Taylor Oil & Peanut Mills, Moultrie, Ga.

Gin Equipment for Sale

FOR SALE At Sacrifice—3-80 saw Murray gin outfit, complete, less press end, but including gin stands, condenser, lint flue, separator, distributor, seed scales, all fans and transmission and Mitchell 60" Super Units with Super-Jems. To be moved—Charles H. Kitchens, Gough, Georgia.

FOR SALE—4-80 Pratt Continental brush gins. Double X feeders. Belt distributor. Two 5-cylinder Hardwicke-Etter steel cleaners. 60" steel condenser. Steel tramper. Wood steel-bound press. Triplex pump with idler pulley. 22' Howe 10 ton scales, steel sills. Will sell with or without buildings.—Lamar Cotton Oil Company, Paris, Texas.

FOR SALE—Two Gullett cotton gins complete. One with 3 and one with 4 gin stands. Will sell all or substantial part at sacrifice price.—For details, write The Latreille Estate, Inc., Jennings, La.

FOR SALE—4-80 Murray air blast gins, glass fronts, quick roll dump, ball bearing, direct connected. Air blast fan and lint flue. 75 h.p. electric motor ball bearing slip ring complete with starter. Continental triplex belted press pump. Gins with new fronts have ginned less than 2,000 bales. Very cheap.—R. C. Kobel, 114 North 25th, Fort Smith, Ark.

FOR SALE—4-80 saw Lummus double moting gins with full length seed and hull conveyors under gins, gin couplings, air blast pipe and fittings and complete tail shaft assembly, price, $3,200.00; one 4-80 saw complete lint flue system with bevel connections and supports, price, $400; four Thermex extractors with supports, V-belt drives from saw shaft, hot air manifold and piping, moist air suction piping and temperature gauge, price $2,600.00; one 4-80 saw Lummus single conveyor distributor complete with hoppers and overflow shield, price, $650.00; one 10-ft. long Lummus hull separator cleaner (bur machine) with supports, platform type catwalks, ladders and guard rails, overhead countershaft assembly with hanger bearings, price, $1,800.00; one 8-ft. wide 4-cylinder horizontal Lummus cleaner with supports, dirt hopper and discharge hood, price, $900.00. The above machinery is only four years old and in excellent condition. Jack Robbins, c/o Planters Cotton Oil and Fertilizer Co., Scotland Neck, North Carolina.

FOR SALE—One 48 in. all-steel side-draft Continental condenser. Good condition.—DaCosta Ginnery, on Port Lavaca Hiway, Phone 3610W1, Route 2, Victoria, Texas.

FOR SALE—Complete 5-80 Murray lint cleaner installation with all accessories. Ginned less than 150 bales. A bargain. Phone or write Luna Cotton Coop., Deming, N. M.

FOR SALE—5-60" Continental master double X, V-belt extractor feeders. 5-80 saw Lummus DC air blast gin stands, complete with lint flue and saws and ribs in first class condition. 1-75 h.p., 440 volt 900 r.p.m. G.E. motor and starter. 1-10 h.p., 220 volt 1750 r.p.m. motor and starter. 1-240 h.p. M-M Twin City 600 r.p.m. butane or gas motor. This machinery was in operation last season and ginned over 1400 bales. Reason for selling I am enlarging my gin. Will sell all or separate units, priced to sell.—H. H. Schawe, Maxwell, Texas, Telephone Martindale 78 F 1 3.

FOR SALE—4-80 saw Murray gin stands with Bluett extractor feeders. 5-70 saw Continental double X extractor feeder. 4-70 Murray gins, late model, ginned about 1500 bales. Continental steel-bound press with counterbalance springs. Jacobs tramper. 120 h.p. Fairbanks-Morse full diesel engine.—Lamar Cotton Oil Company, Paris, Texas.

FOR SALE—One 5-90 set Continental saw type lint cleaners with by-pass valves, ducts, etc., 1949 model. One 5-90 set Continental saw type lint cleaners with by-pass valves, ducts, etc., 1951 model. Both sets lint cleaners complete for 5-90, or 5-80 saw gin outfits. About half price for quick sale. Contact Growers Co'op Gin, Wasco, Calif.

FOR SALE—5-70 saw Lummus automatic ball bearing gin plant to be moved. Electric powered. All-steel 10' Murray bur machine with 3-cylinder after-cleaner. All steel Lummus condenser. Machinery has had little service. Price right. Have large assortment of other gin machinery. What do you need. Address, Gin, P. O. Box 216, Brookshire, Texas.

FOR SALE—6 Lummus 678-80 saw automatic gin stands, all steel fronts. 6-80 saw Lummus L.E.F. feeders and conveyor distributors to match. Now in use as unit. Priced for a quick sale.—Valley Gins, Peoria, Ariz. Phone J. S. Francis, Jr., YE 7-7693.

FOR SALE—Complete gin machinery, 5-70 Lummus powered by M-M (or Twin City) engine to be moved with or without gin building.—M. A. Holscher, Travis, Texas.

THREE GINS FOR SALE—One 4-80 complete Lummus air blast electric motor powered plant. One 5-70 Continental and one 4-80 Continental plant, both powered Hercules gas engines. Want trade for other income property or will sell very cheaply, liberal credit terms, any one or all three plants excluding land and buildings. Cotton no longer produced in justifiable quantities areas where these gins located near Tulsa, Okla. Contact owner Louis Abraham, P. O. Box 7151, Tulsa.

FOR SALE—Nine 70-saw all-steel Continental gin brushes for late model gins, $50 each. C. E. Dean & Company, Lubbock, Texas.

FOR SALE—3-80 Lummus all-steel gin. Mitchell feeder-cleaners. Hardwicke-Etter cleaning equipment. Wood steel-bound press. New LeRoi engine. Gin complete with all-steel buildings, $15,000.00—Nuyaka Trading Co., Nuyaka, Okla.

FOR SALE—One big reel dryer, Murray, No. 18 with or without 52" Murray separator.—J. L. Smallwood, Phone 72 or 320, Box 1908, Levelland, Texas.

FOR SALE—One 3-stand conveyor, Mitchell distributor with overflow shield. 1-3 cyl. 53" Mitchell pre-cleaner. 1-40" Continental C. I. suction fan. 1 Continental upright hydraulic pump. 1 Cameron tramper. 1 wood press with steel sills and ram. 1-40" Rembert unloading fan. 3-70 Continental brush gin stands with lint flue. This is all in good condition and priced to sell. Write or call Mildred Foley, Eufaula, Okla.

FOR SALE—1 Continental all-steel late model bur machine with automatic feed with 40 ft. of by-pass. 1 Wichita all-steel 14 ft. bur machine.—H. C. Ritchey Gin, Frisco, Texas. Phone No. 6 or 908.

FOR SALE—Complete 4-80 automatic Lummus gin plant, Mitchells, paragon press, all-steel building. Ready to operate or easy to move. Bargain.—Fortson Bros., Box 1321, Phone 1883, Corsicana, Texas.

FOR SALE—Two Lummus presses, one hinge door and one drop door; Cameron tramper, two Lummus 50-inch up-draft condensers, two Fairbanks seed scales, one #2 Atteberry seed sterilizer, 10 70-saw Lummus wood front gins, 10 Lummus feeders, two belt distributors with change bale hoppers, two Hardwicke-Etter flat screen separators, 25 70-saw lint flues complete, one 50-inch all-steel blow-in cleaner and fittings, 1-6 cylinder Lummus horizontal cleaner, two Lummus horizontal press pumps, 1 double 45-inch Lummus fan, 40-inch Lummus fan, one Hardwicke-Etter ball joint 2-section wagon telescope, one lot of shafting bearing stands, sheaves and pulleys. Contact J. F. Ward, Farmers' Gin Company, Rosenburg, Texas.

TO BE MOVED—5-80 Lummus gin, super Mitchell feeders, Mitchell steel conveyor distributor, Lummus 10' steel hull separator and cleaner, 4-cylinder 8' Lummus steel cleaner, 72" Lummus steel separator cleaner, 16-unit Lummus thermo cleaner, seed scales, rotary lift, lint flue, nearly new Lummus 72" condenser. Line shafting, V-belts, fans etc. No press. No junk. At a price you can afford to pay.—Taft Cooperative Gin, W. L. Roots, Taft, Texas. (Putting in all new Continental).

FOR SALE—Cotton Gins, Compresses and Oil Mills. If buying or selling it is to your advantage to contact us. Only handle the best with the best price. Call, Write or Wire M. M. Phillips, phone Day or Night 5-8555, Box 1288, Corpus Christi, Texas.

FOR SALE—One of the finest and most complete 5-80 Murray Gins in the Rio Grande Valley. Lots of cleaning and drying equipment, large all steel Gin house, Cotton house and Seed house. This plant has four year average of over 5000 bales. Well located on 30 acres of land, surrounded by about 12,000 acres of cotton land, 10 miles to nearest competitor. About 25 houses on this 30 acres, the best one of which cost $10,000. This set-up cost in excess of $250,000 four years ago and Owner will now take $125,000 with little as $30,000 cash and five years on balance. Have to see this to appreciate it. Call or wire immediately for appointment to look at it. M. M. Phillips, Phone 5-8555 Day or Night, P. O. Box 1288, Corpus Christi, Texas.

FOR SALE—1 Murray 10 foot center feed, all steel Murray bur machine with 3-drum after cleaner, 2-10 ft. 46 model Continental all steel bur machines, with steel trough and conveyors. 4-80 master double X Continental feeder cleaners V-belt. What do you need—I am equipped to haul and install your machinery bought from me. Displayed at my warehouse. Spencer Cotton Gin Sales & Service, dealing in new and guaranteed used cotton gin machinery, lot 5 miles north on Hiway 81, Georgetown, Texas.

FOR SALE—4-80 all steel Lummus gin, tower drier, cleaners and power. Good condition. Write Box "MU" c/o The Cotton Gin and Oil Mill Press, P. O. Box 444, Dallas, Texas.

FOR SALE—One 4-80 all steel Gullett gin; all steel down-packing press; Lummus tower dryer; 6 drum incline cleaner; new Mitchell super units, new ribs and saws this season. Wallace Rudder, Decherd, Tenn.

FOR SALE 4-80 saw Murray, electric, all steel, all steel panel bldg., 120 x 30 x 24 high. 40 ft. scales. To be moved, $35,000.00. 5-80 saw Continental gins installed last season, diesel power, all steel, with steel bldg., 8 acres, three houses. Irrigated area. Price $70,000.00, carry $40,000.00 loan. —W. T. Raybon, Phone 27802, Box 41, Lubbock, Texas.

GINNERS—When in need of machinery or power —Call us first. We have many items of new and reconditioned equipment in stock, ready for prompt shipment.—R. B. Strickland & Co., Tel. 2-8141, Waco, Texas.

Equipment Wanted

WANTED—7-cylinder Wichita, all-steel 50" incline cleaner. Howard & Heard Gin, Box 597, Slaton, Texas. Phone 415.

WANTED—Steam cottonseed sterilizer meeting requirements. Quote price. Address, Gin, P. O. Box 386, Whitewright, Texas.

WANTED—Would like to buy late model 70" or 72" cleaners.—Nickels Gin, Muleshoe, Texas.

WANTED—Late model droppers all sizes, steel only, complete gins to dismantle. Please advise with make and price in first letter. Spencers Cotton Gin Sales & Service, 5 miles north on Hiway 81, Georgetown, Texas.

WANTED—4-80 saw late model gin stands and lint flue to fit under 60 in. feeders. Must be in first class condition and priced right. Write Box "HA" c/o The Cotton Gin and Oil Mill Press, P. O. Box 444, Dallas, Texas.

Personnel Ads

WANTED—Man capable of operating and repairing Murray gins, extractors, diesel engine. Would like to hear from experienced, reliable, sober man at once.—H. W. Hillman, 213 S. Menefee, Edna, Texas.

Power Units and Miscellaneous

FOR SALE—New and rebuilt Minneapolis-Moline engines, from 35 h.p. to 220 h.p., call us day or night for parts and service.—Fort Worth Machinery Co., 913 E. Berry St., Fort Worth, Texas.

FOR THE LARGEST STOCK of good, clean used gas or diesel engines in Texas, always see Stewart & Stevenson Services first. Contact your nearest branch.

PRACTICALLY NEW GMC 1952 model truck and Fruehauf 34 ft. tandem trailer. Used only few weeks, 26 mile flat run. Total of 6192 miles. Air brakes, heater, etc. 54" removable sides. Handles 60 bales cotton or 17 tons cottonseed.—C. J. King, Box 3132, Lubbock, Texas.

GEESE FOR COTTON WEEDING—Control Johnson and Bermuda grasses. Buy your day-old goslings from the country's largest producer of cotton-weeding White Emdens. Live delivery guaranteed, sturdy stock, easily raised, thousands hatching weekly. Low prices.—Norwalk Hatchery, Box 283A3, Norwalk, Ohio.

FOR SALE—Fairbanks-Morse 140 h.p. diesel engine, model 32, style VA. Good condition, must be moved. Also, 125 h.p. boiler.—Boonville Ice Co., Box 487, Columbia, Mo.

FOR SALE—Two-ply 13 inches wide 69 feet inlet leather belt. Good condition. Reasonably priced. W. D. Waddle, Rt. 1, Greenville, Texas.

BARGAIN PRICE FOR QUICK SALE—LeRoi engine and equipment: One LeRoi 12-cylinder, 600 h.p., 7 x 7½ mode 250-AL3460 natural gas engine with water circulating pumps, gasoline starting engine, direct connected to E. Machine Co. 250 kw, 75 amp. 1200 rpm., 3-phase, 60 cycle, 2400 volt generator with excitation of 22.3 amp., 125 volts. Six Cylinder Engine and Equipment: One Fairbanks-Morse 6-cylinder, 360 hp. 14" x 17" 257 rpm., engine with water circulating and fuel pump, direct connected to Fairbanks-Morse type D300 k.v.a., 240 kw, 3-phase, 60 cycle, 2400 volt generator, Fairbanks-Morse shunt wound, type MX 120 amp., 125 volt, 15 kw exciter. Four Cylinder Engine and Equipment: One Fairbanks-Morse 4-cylinder 200 hp., 14 x 17 257 rpm. Hot head engine circulating and fuel pump, direct connected to Fairbanks-Morse type D, Ser. 92041, 170 k.v.a., 136 kw 3-phase, 60 cycle, 2300 volt generator using type O. P. 10 kw, 1400 rpm. 80 amp. 125 volt exciter. All switch board equipment, regulators, synchronizing equipment etc. incident to parallel operation of these engines as a unit. Can be seen in operation.—Producers Cooperative Mill, Midlothian, Texas.

FOR SALE Steam engine, modern type spinner counter flow, 14 x 15. Excellent condition. $500.00 f.o.b. Stonewall, Okla. Jimmy Hall, P. O. Box 751, Dallas, or Telephone RIverside 1393.

FOR SALE—One compiete 4-80 gin. LeRoi engine power. Good condition. Not sufficient cotton raised to justify operation.—Toller Bros., Fort Smith, Ark.

FOR SALE—Two LeRoi, 12-cylinder RXISVW, gas engines completely overhauled with guarantee at reasonable price.—The National Supply Company, P. O. Box 9877, Fort Worth, Texas, Telephone SU-5441.

FOR SALE—One Fairbanks-Morse type Y vertical 6-cylinder diesel engine with 40 x 28 clutch pulley, 300 hp., 257 rpm., Serial 573955, Style V. One Fairbanks-Morse Type Y vertical diesel engine, 120 hp., 257 rpm., 60 x 16 clutch pulley—Serial 662850—Style VA. Will sacrifice for quick sale.—Western Cottonoil Co., P. O. Box 1491, El Paso, Texas.

Ammoniated Citrus Pulp Promising for Cattle

Ammoniated citrus pulp, which can be varied between 12 and 18 percent protein equivalent, may prove to be a new and important cattle feed, says Dr. George K. Davis, Florida Experiment Station, Gainesville. Ammoniated citrus pulp is not now in commercial production, but has been produced in small quantities and tested since 1945.

Dr. Davis says results have been good from feeding ammoniated citrus pulp up to as much as 25 percent of the total ration of young steers. These steers made gains of two pounds a day on this feeding test. Older animals can use more of this feed than can younger animals. Experiment Station tests show that the nitrogen from the ammonia in ammoniated citrus pulp is 85 percent as valuable as the nitrogen from the best protein concentrates.

The added nitrogen in ammoniated citrus pulp is not protein, Dr. Davis stresses, but this nitrogen can be converted to usable crude protein in the cow's rumen. Only cattle or other ruminants can use it, though.

When ammoniated citrus pulp does go on the market, it probably will be cheaper than other feeds containing the same amount of nitrogen, Dr. Davis thinks. A unit of nitrogen in this feed should cost about one-third as much as a unit of nitrogen from urea, the present leading source of non-protein nitrogen.

By using ammoniated citrus pulp, cattlemen will eliminate the danger of urea toxicity. Urea will poison cattle if too much of it is fed or if it is fed under the wrong conditions. Ammoniated citrus pulp is not toxic to cattle.

U. S. Farm Exports Value Drops 19 Percent

U.S. agricultural exports dropped 15 percent on a dollar value basis in 1952, according to USDA. The decline was from the postwar record year of 1951 when the value of such exports rose to $4,040,054,000. The 1952 total valuation was $3,424,738,000. Agricultural products constituted 23 percent of the total export value in 1952, compared with 26 percent in 1947 when total exports reached an all-time high. During the five years preceding World War II (1934-38), when U.S. total exports averaged $2,624,000,000 annually, exports of agricultural products averaged $763,000,000 annually, or 29 percent of the total.

The three leading U.S. agricultural exports in 1952 were wheat and wheat flour worth $941,150,000, cotton valued at $862,189,000, and leaf tobacco amounting to $25,102,000. There was a large reduction in exports of all dairy products except condensed milk, and a considerable drop in exports of dried eggs, lard, cotton, apples, pears, grain sorghums, wheat, shelled peanuts, soybean oil, field and garden seeds, tobacco and dried peas.

May Best Time to Plant Mississippi Soybeans

The best planting date for soybeans in Mississippi is early May, says W. R. Thompson, Extension agronomist. Regardless of when planted, soybeans of the same variety will mature within a few days of each other. Both early planting and late planting will cut yields, he pointed out.

He recommends planting three different varieties in order to stagger the harvesting period. Dorman is the recommended variety for early harvest, Ogden for mid-season, and Roanoke for late harvest.

"Farmers should plant around 60 percent to Ogden soybeans," the Mississippi agronomist urges. "Then plant 20 percent of the acreage to Dorman and 20 percent to Roanoke."

Recommended planting rate for grain is 45 pounds of seed per acre in rows. If planted too thick, beans are likely to have small stems and fall over before harvest time.

A good seed-bed is important to successful soybean production, Thompson adds. A good planting depth is one-half to one inch. Planted on land never before planted to soybeans, the seed should be inoculated; however, where beans have been planted in the past, no inoculation is needed.

■ **NORMAN WILLIAMS, formerly of Atlanta, has been named regional vice-president in Dallas for Best Foods, Inc. He succeeds PALMER SCHADE who will continue with Best Foods as consultant and special representative.**

(Continued from page 71)

plowing should be destroyed before fruiting so as to create a host-free period between crops. These cultural practices will not only control the pink bollworm but also the boll weevil.

In the lightly infested areas of central and eastern Texas, beyond the limits of regulated cultural controls where harvest is completed close to or after occurrence of frost, as many bolls as possible should be removed by snapping, mechanical stripping, or by heavy pasturing before the stalks are destroyed and the debris plowed under.

In cold, arid regions such as western Texas, where harvest must be completed after frost, as many bolls as possible should be removed by snapping, mechanical stripping, or by heavy pasturing. The cotton stalks should be left standing during the winter months, since the highest mortality in such areas occurs in bolls on standing stalks. Where the stalks are plowed under early in the winter the fields should be winter irrigated. For best results the cultural practices outlined above should be carried out on a community-wide basis and the cooperation of every grower is needed.

Warning—In areas where cottonseed are treated as a continuous process of ginning and gin trash is disposed of properly, records accumulated over a number of years prove beyond a doubt that pink bollworms are carried over from one year to the next principally in debris left on the soil in the fields. This is true even though the stalks may be cut promptly after harvest. **Stop that carry-over** by following, subsequent to stalk destruction, additional practices recommended for your area. In all infested areas start pink bollworm control measures before your crop begins to show actual damage from this dangerous insect.

• **Seed Corn Maggot**—The seed corn maggot, **Hylemya cilicrura** (Rond.) may seriously affect the stand of cotton, particularly when planting closely follows the turning under of a green manure crop or other heavy growth. This insect may be controlled with 2 ounces of lindane applied as a wettable powder onto each 100 pounds of planting seed. Seed should be treated immediately before planting.

• **Spider Mites**—Spider mites have become increasingly important pests of cotton. The use of organic insecticides for cotton insect control has been a major factor in the changing importance of these pests.

Species known to attack cotton in the United States are the two-spotted spider mite, **Tetranychus bimaculatus** Harvey; the Atlantic spider mite, **T. atlanticus** McG.; the Pacific mite, **T. pacificus** McG.; the desert spider mite, **T. desertorum** Banks; the tumid spider mite, **T. tumidus** Banks; the Schoened spider mite, **T. schoenei** McG.; the Canadian spider mite, **T. canadensis** (McG.); and the brown wheat mite **Petrobia latens** (Mueller). These species differ in their effect on the cotton plant and in their reaction to miticides. Accurate identification of the species is essential.

The two-spotted spider mite is the most difficult species of spider mite on cotton to control. It occurs as the green form in many areas and as the carmine subspecies **(T. b. multisetis)** in the South and in southern California. The green form can be controlled by applications of Systox at 0.25 to 0.50, Aramite at 1, and Ovotran at 2 to 3 pounds per acre. Sulfur, TEPP, parathion, malathon, and EPN do not give effective control of the green form. Parathion at 0.10 to 0.40, Aramite at 1, Ovotran at 2 to 3, and Systox at 0.25 to 0.40 pounds per acre give effective control of the carmine form.

The Pacific spider mite is restricted to the Pacific Coast, where it has been a major pest of cotton. Sulfur at 60, Systox at 0.25 to 0.40, Ovotran at 2 to 3, and Aramite at 1 pounds per acre give effective control of this species. The organic phosphates are not satisfactory.

The Atlantic spider mite feeds in restricted colonies and causes strawberry-colored spots on the upper surface of the leaves. The bottom of the plant is attacked first and comparatively few mites can cause severe defoliation. Sulfur at 10 to 15, parathion at 0.3, Systox at 0.25 to 0.40, Ovotran at 2 to 3, and Aramite at 1 pounds per acre give effective control.

The desert spider mite and the tumid spider mite are controlled by applications of sulfur at 20 to 25, parathion at 0.1 to 0.25, and Aramite at 0.3 to 0.75 pound per acre. TEPP at the rate of 0.5 pint of the 40-percent concentrate, or its equivalent, gives control of these species but several applications may be required.

The brown wheat mite may attack seedling cotton. Sulfur at the rate of 50 pounds per acre during warm weather and parathion at the rate of 0.3 pound per acre during cool weather control this species.

In some areas where mites are a problem, they may be effectively controlled by including compartively low rates of miticides in all applications of cotton insecticides. For control of some species and as a depressant for others, at least 40-percent sulfur may be incorporated in all dust applications. Elemental sulfur can not be incorporated in sprays applied at low gallonage. Other miticides may be substituted.

Sulfur is most effective when finely ground and when applied at temperatures above 90° F. Thorough coverage is essential for effective results in the use of miticides.

• **Stink Bugs**—Several species of stink bugs including the conchuela, **Chlorochroa ligata** (Say); the Say stink bug, **C. sayi** Stal; the southern green stink bug, **Nezara viridula** (L.); the green stink bug, **Acrosternum hilare** (Say); the brown cotton bug, **Euschistus impictiventris** Stal; the brown stink bug, **E. servus** (Say); **E. variolarius** (P. de B.); **E. tristigmus** (Say); the red-shouldered plant bug, **Thyanta custator** (Fab.); **T. rugulosa** (Say); **T. brevis** Dan D.; and **T. punctiventris** Van D. attack cotton. The importance of these pests and the species involved varies from year to year and from area to area. The damage which they cause is usually confined to the more mature bolls and may result in reduced yields and quality of both lint and seed. Dieldrin and BHC at 0.5 pound per acre have given excellent control of these stink bugs. Toxaphene at 6 pounds per acre has given fair to good control and is sometimes preferred where there is a bee hazard involved.

A dust containing 2 percent of BHC, 5 percent of DDT, and 50 percent of sulfur applied at the rate of 15 to 30 pounds per acre also gives excellent control of the insect complex consisting of stink bugs, lygus bugs, bollworms, and the cotton aphid and is widely used for the control of these pests in the Western areas.

• **Thrips on Seedling Cotton** — Thrips often cause injury to cotton seedlings, especially in areas where vegetables, legumes, and small grains are grown extensively. The tobacco thrips, **Frankliniella fusca** (Hinds), onion thrips, **F. tritici** (Fitch), **F. runneri** (Morg.), **F. exigua** Hood, and **Sericothrips variabilis** (Beach) have been reported as damaging cotton seedlings. In some areas it has been shown that cotton plants usually recover

2-3,000 Tons of Seed Per Mill

By W. B. STONE
President, Valley Oilseed Processors Association

■ THE U.S. Department of Agriculture reports insects destroy between 2,000 and 3,000 tons of cottonseed per year for each operating oil mill. Obviously, effective insect control in an area from which a mill obtains its seed will mean a larger crush and more profits.

It has been demonstrated on many occasions that insect control is profitable to the cotton farmers. Per-acre yields have been increased 50 percent and more where effective control was applied in heavy infestations.

There are many ways that oil mills can promote good insect control in their local territories. Any mill manager should recognize that insect control is a technical subject, and its "selling" to farmers involves special educational methods. A manager can waste valuable time attempting to promote insect control by himself. He should work with his county agent, who can show him how his efforts can do the most good.

GEORGE STROUP is Oklahoma's new Extension cotton specialist in production and marketing. His appointment, to succeed Errol D. Hunter, now acting assistant to the Extension Director, was announced Feb. 28 in The Cotton Gin and Oil Mill Press.

and controls are not recommended, unless the stand is threatened. In other areas, to the contrary, it has been shown that thrips damage is more severe than generally realized. Although thrips usually injure seedling cotton, damaging infestations sometimes occur on older cotton in certain areas.

The destruction of leaf tissue by thrips, and subsequent slow plant growth, make the seedlings more susceptible to injury by diseases. Injury by thrips alone, or the combined injury of thrips and disease, may reduce or even destroy stands of young plants. A heavy infestation often retards plant growth and delays fruiting and crop maturity. This delay in crop maturity may increase the cost of harvest and may lower the quality of seed and lint because of the greater damage by insects and deterioration associated with unfavorable weather conditions.

A number of insecticides properly applied give satisfactory control of thrips and are recommended when the situation warrants their use. Toxaphene at the rate of 0.75 to 3 pounds of the technical material per acre in either dusts or sprays gives effective control. A spray mixture consisting of 0.5 of toxaphene plus 0.25 pound of DDT per acre, or a dust or spray mixture of DDT and BHC applied at a rate of 0.05 pound of gamma isomer plus 0.25 pound of DDT per acre is also effective.

Heptachlor or aldrin applied to young seedlings as a spray or dust at the rate of 0.08 to 0.125 pound per acre gives good thrips control. Dieldrin applied at the rate of 0.05 to 0.25 pound per acre is very effective.

Other insecticides that give satisfactory control either as a spray or a dust are chlordane at 0.5 to 1 pound per acre, BHC 0.1 to 0.2 pound of gamma isomer, and DDT 0.25 to 1.5 pounds. DDT has not given satisfactory control at temperatures above 90° F. Sprays are more effective than dusts for thrips control on seedling cotton. When applications are made by airplane, the dosages mentioned above should be increased by at least 50 percent.

Some of the phosphate compounds are effective against thrips, but are not generally recommended because they are extremely poisonous. (See Bean Thrips.)

• **Tobacco Budworm**—The tobacco budworm, **Heliothis virescens** (F.), represents an important part of what has been referred to as the "bollworm complex" in the states from Texas eastward. In this area during the early part of the fruiting period the budworm is usually more abundant on cotton than the true bollworm. As the season progresses the relative abundance of these two species gradually changes. By the time cotton matures, abundance of the two species is roughly the same in the Carolinas, while in Texas the budworm has reverted to a position of minor importance.

So far as is known, controls that are effective against the bollworm on cotton are equally effective against the tobacco budworm.

• **White-fringed Beetle** — The white-fringed beetle, **Graphognathus leucoloma** (Boh.), and **G. peregrinus** (Buch.), and **G. minor** (Buch.) are pests of cotton and many other farm crops. They are present in limited areas of Alabama, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee.

Larvae of the white-fringed beetles damage cotton by feeding on the roots of young plants. These insects can be controlled by the use of good cultural practices and insecticides. Good cultural practices recommended include the following:

1. Plant oats or other small grains in heavily infested areas.

2. Restrict planting of summer legumes, such as peanuts, soybeans, velvetbeans, or other favorable host plants of the adult beetles to not more than one-fourth of the total crop land. Do not plant these crops on the same land more often than once in 3 or 4 years.

3. Do not intercrop corn with peanuts, soybeans, crotalaria, or velvet beans. Prevent the growth of broadleaved weeds, such as cocklebur and sicklepod.

4. Improve poorer soils by turning under winter cover crops.

DDT is effective for control of white-fringed beetle larvae. Apply 50-percent DDT at the rate of 20 pounds per acre, or 25-percent DDT at the rate of 40 pounds per acre, evenly to the soil surface as a dust, spray, or mixed with sand. Thoroughly mix it into the upper 3 to 4 inches of soil. This treatment will give control of larvae for at least 5 years. DDT may be used in the drill before planting. Use 50-percent DDT at the rate of 5 to 10 pounds per acre, or 25-percent DDT at the rate of 10 to 20 pounds per acre, mixed with sand. This mixture may be applied by hand or by a fertilizer distributor, at or slightly below the depth of seed planting.

Either toxaphene or BHC-DDT mixture applied on cotton foliage gives a residue in the soil that aids in the control of these beetles. These insecticides should be used for the control of those cotton insects for which they are recommended in white-fringed beetle infested areas.

• **White-lined Sphinx** — The white-lined sphinx, **Celerio lineata** (F.), occasionally occur in uncultivated areas in large numbers and migrate to cotton fields. In the cotton fields they may be controlled with DDT at 1 to 1.5 or with toxaphene at 2 to 3 pounds per acre applied as dusts or sprays. Migrations may be stopped by barrier strips of 10 percent of DDT or 20 percent of toxaphene.

• **Whiteflies** — Whiteflies are usually kept in check by parasites but occasionally may be serious late in the season. Parathion at 0.25 to 0.5 pound per acre is effective in controlling these insects, but is also very detrimental to their parasites. DDT, TDE, and methoxychlor are also effective against whiteflies.

• **Wireworms**—Several species of wireworms are associated with cotton. Perhaps most noticeable damage is caused by the sand wireworm, **Horistonotus uhlerii** Horn., in South Carolina, Louisiana, and Arkansas. Adults of the tobacco wireworm (spotted click beetle), **Conoderus vespertinus** (F.), are frequently found on the cotton plant, but the amount of damage to cotton caused by larvae of this species is not known. Wireworms in combination with false wireworms and the seed corn maggot sometimes prevent the establishment of a stand of cotton. This may be prevented by treating the seed with 2 ounces of lindane per 100 pounds in a slurry.

Approved crop rotation practices, increased soil fertility, and added humus help to reduce damage to cotton caused by the sand wireworm. Aldrin, DDT, and BHC have shown promise in the control of this and other species of wireworms on other crops. Additional research on the control of wireworms attacking cotton is needed. Chlordane at the rate of 1 pound per acre as a row application is effective.

• **Yellow-Striped Armyworms**—The yellow-striped armyworm, **Prodenia ornithogalli** Guen., and the western yellow-striped armyworm, **P. praefica** Grote, may at times cause considerable damage of cotton. **Prodenia ornithogalli** has proved to be the most difficult of all the "bollworms" to kill with organic insecticides. EPN (O-ethyl O-p-nitrophenyl benzenethiophosphonate) at 0.3 pound per acre applied as an emulsion spray was superior to any of the chlorinated hydrocarbons. However, when used in the early stages of worm development, toxaphene at 2.5 pounds per acre, DDT at 1 pound, and dieldrin at 0.3 pound in an emulsion spray gave fair control. Dieldrin in a 3-percent dust and toxaphene in a 20-percent dust applied at the rate of 15 pounds per acre also gave good kills of a mixed population of large and small yellow-striped armyworms.

The western yellow-striped armyworm, which only attacks cotton in California, is easily controlled with DDT at the rate of 1 to 1.5 pounds per acre when these insects are in the cotton. Migrations from surrounding crops may be stopped by barriers of 10-percent DDT or 20-percent toxaphene at the rate of 2 to 4 pounds per 100 feet.

Miscellaneous Insects

The cabbage looper, **Trichoplusia ni** (Hbn.), and several other closely related

Quotes From Our Authors:

"THE POSSIBILITY of utilizing the pink bollworm resistance now believed to be present in certain wild cotton species (is) an example of what might also be done in breeding for resistance to other damaging cotton insects."—T. R. RICHMOND.

species occasionally cause damage to cotton in localized areas. Dusts containing 10 percent of DDT or 20 percent of toxaphene, or a combination dust containing 5 percent of DDT and 15 percent of toxaphene applied at the rate of 10 pounds per acre or sprays containing toxaphene or DDT applied at the respective rates of 2 pounds and 1 pound per acre are effective.

The corn silk beetle, **Luperodes brunneus** (Crotch), has been reported as a pest of cotton in localized areas in several states but little is known about it.

Cotton root aphids: The species of root aphids known to attack cotton are the corn root aphid, **Anuraphis maidi-radicis** (Forbes); **Triphidaphis phaseoli** (Pass.); and **Rhopalosiphum subterraneum** Mason. So far as is known, injury by root aphids to cotton is confined to the eastern Seaboard. Several species of ants are known to be associated with root aphids, the principal one being the corn field ant, **Lasius niger alienus americanus** Emery. Chemical control of root aphids has been directed at control of the corn field ant. Some of the newer materials are known to be effective as soil insecticides, and it is suggested that they be tested against root aphids attacking cotton. They injure cotton chiefly in the seedling stage. Since cotton in this stage often shows signs of injury without any evidence of insects being present, it is suggested that careful examinations of the underground portions be made to determine the possibility of root aphid attack. Ant mounds at the base of seedling plants indicate the presence of root aphids.

The cotton square borer, **Strymon melinus** (Hbn.), occurs throughout the Cotton Belt, but rarely causes economic damage. The injury this insect causes to squares is often attributed to the bollworm.

The cotton stainer, **Dysdercus suturellus** (H.-S.), is found within the United States in Florida only. However, probably owing to mistaken identity, the literature also records it from Alabama, Georgia, and South Carolina. No work on control has been formally reported in recent years, but observations indicate that dusts containing 10 percent of toxaphene or sufficient BHC to give 1 percent of the gamma isomer will control insects of this genus. Indications are that DDT may also be effective in some areas.

The cowpea aphid, **Aphis medicaginis** Koch, occurs commonly on very young cotton, especially on the cotyledonous leaves. Cotton is not believed to be a true host of this species, and the insect will not complete a life cycle on the cotton seedling.

Flea beetles: These insects damage young cotton in some areas. They can be controlled with chlordane at the rate of 0.5 pound per acre as a dust or spray, with aldrin at the rate of 0.25 to 0.5 pound per acre, with dieldrin at the rate of 0.25 to 0.33 pound per acre, with DDT at the rate of 1 pound per acre, or with toxaphene at the rate of 2 to 3 pounds per acre.

The salt-marsh caterpillar, **Estigmene acrea** (Drury), can be controlled with toxaphene applied as either a dust or a spray at the rate of 3 pounds of technical material per acre, preferably when worms are small. If worms are large, 4 to 5 pounds of toxaphene in a spray or a dust containing 5 percent of DDT plus 15 percent of toxaphene plus 40 percent of sulfur applied at the rate of 20 to 40 pounds per acre will be required.

State Guides

(Continued from page 27)

ate has the best dusting properties and longest residual action. It also is the slowest killing one.

• **Toxaphene**—Excellent for boll weevil control, good for bollworm control, and prevents aphid build-up, if used in every application. Repeat applications that are washed off within an entire daylight period. Use 40 percent sulphur in dust mixtures to prevent red spider build-up. Apply dusts in late afternoon, night, or early morning. Toxaphene is available as a spray.

• **3-5-40 and 3-10-40** —These formulae are insecticide mixtures containing **3 percent Gamma BHC, 5 or 10 percent DDT, 40 percent Sulphur.** Excellent for boll weevil and aphid control. When 10 percent DDT is used, it is excellent for bollworm control. Repeat applications that are washed off within four hours. Include sulphur to prevent red spider build-up. Use in late afternoon, night or early morning. With mid-day applications, fumes of BHC are quickly dissipated and control is poor, despite the fact that many weevils are killed in open blooms. The 3-5 mixture is also available in liquid formulations.

• **2.5-5-40** — This formula is an insecticide mixture containing **2.5 percent Aldrin, 5 percent DDT, 40 percent Sulphur.** —Excellent for boll weevil and good for bollworm control. DDT should be included for bollworm and increased to 10 percent if needed. Sulphur should be included to prevent red spider build-up. Aphids may build up on this mixture. Repeat applications washed off within four hours after application. Aldrin is available in liquid formulations and DDT should be added to the spray for bollworm control.

• **2.5-5-40** — This formula is an insecticide mixture containing **2.5 percent Heptachlor, 5 percent DDT, 40 percent Sulphur**—Recommendations the same as for the mixture containing Aldrin.

• **1.5-5-40** — This formula is an insecticide mixture containing **1.5 percent Dieldrin, 5 percent DDT, 40 percent Sulphur** — Recommendations same as for mixtures containing Aldrin and Heptachlor. It has longer residual action than these materials.

• **DDT**—Excellent for bollworm control when used at 1 to 1.5 pounds of toxicant per acre. Five percent (0.5 pound per

Rates of Insecticide Applications

The following tables give amounts of insecticides to use per acre. The first figure is the mid-summer application on medium-sized cotton with moderate weevil infestations. The second figure is for heavy outbreaks on large cotton. To thin out overwintered weevils on small cotton when squaring begins, use half of the first figure.

DUSTS

Insecticides	Strength of Dust	Amount Per Acre
Calcium arsenate	Undiluted	7-10 lbs.
Toxaphene	20%	10-15 lbs.
BHC-DDT	3-5-40	10-15 lbs.
Aldrin	2.5-5-40	10-15 lbs.
Heptachlor	(Same as Aldrin)	
Dieldrin	1.5-5-40	10-15 lbs.

SPRAYS

Insecticides	Strength of Concentrate	Amount Per Acre*
Toxaphene	4 lbs. per gal. 6 lbs. per gal. 8 lbs. per gal.	2-3 qts. 3-5 pts. 2-3 pts.
BHC-DDT	Enough concentrate to furnish 0.3 to 0.5 lb. gamma BHC and 0.5 to 0.8 lb. DDT per acre.	
Aldrin	2 lbs. per gal. of Aldrin PLUS 2 lbs. per gal. of DDT 1 lb.-2 lbs. mixture of Aldrin and DDT	1-1½ pts. 2-3 pts. 2-3 pts.
Heptachlor	(Same as Aldrin)	
Dieldrin	Enough concentrate to furnish 0.15 to 0.25 lb. Dieldrin and at least 0.5 lb. DDT per acre.	

*This is the amount of concentrate. Dilute with enough water to spray an acre. From 1 to 10 gallons of water may be used for this.

ARKANSAS Boll Weevil Calendar

(Intervals in weeks are approximate and will vary with weather conditions)

When to Act	What the Weevil Does	What Control Measures to Take
When squaring begins	Fresh feeding and egg punctures can be found in first squares. Live weevils can be found if they are numerous.	Look for adult weevils in terminal buds of cotton plants. Where concentrations of adult weevils are found, dust once or twice.
Two to three weeks after squaring begins	Overwintered weevils lay eggs in the first squares, which then flare (bracts spread apart). The grub and pupa stages are passed in them.	Scout for flared squares on the plants and on the ground to locate infested spots. Mark the infested spots.
Four to six weeks after squaring begins	First-brood weevils begin to emerge and feed. They should be killed before they begin to migrate and lay eggs.	Look for weevil punctures in each marked spot once a week. Begin spot dusting as soon as newly-punctured squares are found. If infestation is general, begin blanket dusting when justified by infestation count.
One week later	First-brood weevils begin to migrate short distances and to lay eggs.	Continue scouting at weekly intervals. If new spots are found, dust them. If other general infestations build up, dust them.
Eight to 10 weeks after squaring begins	Second-brood weevils begin to emerge and feed.	Scout ALL cotton once or twice a week, watching for the general rapid rise in infestation that marks the beginning of emergence of second-brood weevils. Dust as needed.
One week later	Second-brood weevils begin to lay eggs and to migrate. In weevil years, this is the late summer dispersal with heavy flights daily.	Continue regular scouting of all cotton. Where infestations justify, dust at four-day intervals until crop is safe (with all bolls at least 16 days old).

Quotes From Our Authors:

"THE JOB of producing cotton profitably in the face of our numerous enemies keeps every one of us on our toes. We now have many weapons with which to fight these enemies, if we use them right. The entomologist, the plant breeder, the producer and distributor of pesticides must share with the farmer the responsibility of effectually stopping these enemies and saving the seventh bale." — F. C. BISHOPP.

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acre) is used in formulations of certain insecticides to keep bollworms from getting out of control.

• **Nicotine**—Good for aphid control. For aphid knock-out, use 3 percent nicotine in hydrated lime. Use in late afternoon, night or early morning.

• **DN-Sulphur**—Good for red spider control. Must be applied from underneath for best results.

• **Aramite**—Good for certain species of red spider. Organic sulphur compounds. It should be used at the rate of 0.6 to 1 pound of technical material per acre.

DUSTING FOR WEEVIL CONTROL

In experiments over a 30-year span, the Arkansas Agricultural Experiment Station found that dusting for boll weevil control more than doubled cotton yields. Dusting was done only in years of severe injury. Fields were chosen where there was active injury, and where infestation appeared to be increasing rapidly. In 1950, for example, dusted plots in Crawford County made an average of approximately 600 pounds of lint cotton per acre, while undusted plots made about 130 pounds.

On the other hand, dusting when flared squares are seen, or in years of light weevil injury, is not profitable. Poor results under such conditions have destroyed the faith of some people in dusting to control boll weevil.

Dusting should be done at the right time, and applied properly, if it is going to be done at all. If aphid, red spider, or bollworm infestations develop and are allowed to go unchecked, damage from them may offset gains from controlling weevils.

Here are some further suggestions:

1. Even distribution of dust is essential.

2. Dust at four-day intervals. Repeat at once any application that is washed of by rain within an entire daylight period for calcium arsenate or toxaphene, or within four hours for 3-5-40, Aldrin, Dieldrin, and Heptachlor.

3. Three or more applications are necessary to hold weevils in check where infestation is general. Do not quit dusting until scouting shows that the infestation is no longer rising and fresh punctures are not being made, or until the crop is safe with all bolls two and one-half weeks old.

SPRAYING FOR WEEVIL CONTROL

Although dusting is the preferred method, sprays may be used. Like dusts, sprays must be applied at the **RIGHT TIME** and the **RIGHT PLACE** to be effective. Experimental work in 1951 and 1952 showed control with sprays to be about equal with dusts. The poor results obtained by Arkansas farmers the past three seasons can largely be attributed to disregard for correct timing. Low dosages, poor equipment, and improper adjustment of spray equipment also contributed to failure of the spray method to give control.

Spraying with concentrate sprays is still a relatively new method of control, and there are still a lot of unanswered questions. Sprays are more likely to cause red spider build-up and foliage injury.

One to 10 gallons of spray are applied per acre. Older types of sprayers—used for applying dilute water sprays— are not satisfactory for applying these concentrate sprays. Spraying can be done in a light breeze, making it possible to apply sprays during a day that is too windy for dusting.

1953 Cotton Insect Control Recommendations for:

California

These control suggestions are made from results obtained by research entomologists of the University of California, State Department of Agriculture, Federal Department of Agriculture and Industry. The control measures given here are not necessarily the only suggestions possible, but on the basis of the available information and a consideration of the hazards to beneficial insects, man and his animals, these are the best recommendations for California. Accurate evaluation of insect and mite infestations and recommendations for their control can best be obtained from trained and experienced personnel. One of the ways which a farmer may obtain such personnel to check his fields is through "supervised control." For further information see your Farm Advisor or Agricultural Commissioner.

Insecticides and miticides should only be used when necessary because "insurance" applications seldom give effective control, are wasteful, and may result in a more serious outbreak of cotton pests. At times spot or border treatments may be advisable. Good control of cotton pests will only be obtained when well formulated dusts and sprays are thoroughly applied under calm weather conditions. Applications with ground equipment usually give better control. However, when aircraft are used it is essential to have competent flagmen. Dust swaths by airplane should be approximately 40 feet wide and spray swaths about 35 feet. These widths may be slightly narrower with certain types of aircraft. Most airplane sprays are applied at a rate of from 5 to 10 gallons per acre. Ground sprays should be applied at whatever low volume rate the equipment will put out satisfactorily, which is usually from 10 to 20 gallons per acre. Some emulsifiable sprays may injure the plants if applied when the temperature is high.

• **Mites** — At least 50 percent sulfur should be incorporated in all dust applications as a control for the Atlantic mite and as a general depressant of other mite species. Sulfur is most effective when finely ground and when temperatures are above 90° F.

• **Lygus Bugs**—Feeding by **Lygus** causes a shedding of squares and young bolls. A similar type of shedding may be caused by excessive nitrogen, improper irrigation, destruction of surface roots by cultivation, adverse weather conditions, or combination of these factors.

The need for **Lygus** treatment may be determined by the sweep method or by the amount of flower damage. For the sweep method a series of 50 sweep samples made with a standard insect net through the tops of one row of cotton should be taken at several locations in the field. When such counts average 10 **Lygus** per 50 sweeps, with each nymph counting as two, control should be under-

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Keep Fields Bug-Free in '53

Losses to Pink Bollworm In South Texas: 1952

In 1952, in 38 South Texas counties, the pink bollworm damaged the cotton crop to the extent of an estimated $28,195-000. In those counties the pest caused a reduction in yield that averaged 12.1 percent.

By K. P. EWING
and A. J. CHAPMAN

A SURVEY by personnel of the Bureau of Entomology and Plant Quarantine to determine the losses caused by the pink bollworm was made in the 38-county area of southern Texas commonly designated as "heavily infested." This area is bordered by Cameron and Hidalgo Counties on the south, Jackson, Lavaca, and Gonzales Counties on the north, and Maverick, Kinney, and Val Verde Counties on the west. Although the pink bollworm is known to have caused some damage outside this area, especially in Pecos, Presidio, and certain other western counties, time did not permit a survey of these counties and no estimate of such damage was made. Insects other than the pink bollworm also caused damage, particularly in the 4-county area of the Lower Valley where the boll weevil caused heavy losses, but every possible effort was made to separate such damage and it is not included in this report.

During October 1952 a spot check was made with farmers, ginners, oil millers, cotton classers, and other key men directly concerned with cotton production and processing. Through these interviews it is believed that sufficient reliable data were obtained to determine the losses fairly well. They were valued at the average price reported by those contacted in the area covered at the time the survey was made.

K. P. EWING, now Head of BEPQ's Division of Insects Affecting Cotton and Other Fiber Plants, USDA, was in charge of BEPQ's expanded pink bollworm research program when this article was prepared.

The total loss caused by the pink bollworm in the 38 counties, as shown in table 1, was $28,195,000. It is felt that this is a conservative estimate, but at the same time it is an alarming amount of damage to be caused by an insect which until the last two seasons had never caused any appreciable loss in the area surveyed. Approximately 70 percent of this loss, or $19,598,000, was due to reduced yields. Other losses were $1,388,000 from seed and waste at the gin; $1,299,000 in oil-mill products such as oil, cake, and linters; $361,000 in grade of lint; and $5,549,000 for insecticides used in fighting the pink bollworm in the field.

Figures thus far indicate that approximately 714,770 bales of cotton were produced on 1,655,618 acres in the 38 counties, an average reduction in yield caused by the pink bollworm of 12.1 percent.

A. J. CHAPMAN is Entomologist, Bureau of Entomology and Plant Quarantine, USDA, Brownsville, Texas.

The damage ranged from extremely light in some of the northern counties to as high as 26.2 percent in the southernmost county of Cameron. In the 4 Lower Rio Grande Valley counties the damage averaged 16.9 percent, and in the 34 counties north of the Valley, 7.8 percent. In the Lower Valley counties 0.65 percent of the acreage suffered damage ranging from 90 to 100 percent and 4 percent of the acreage, from 50 to 90 percent. In the counties north of the Lower Valley 3.4 percent of the acreage was damaged within the range of 50 to 90 percent.

DDT and mixtures containing high percentages of DDT were used in the Lower Valley for control of the pink bollworm. In most places where DDT was intensively used, fair to good control was obtained, but the cost was high, often ranging from $40 to $50 or more per acre. The estimated total cost of insecticides was for pink bollworm control in the Lower Valley. Farmers above the Valley spent very little on insecticides for this control and no value was placed on this item outside the Valley.

Losses at the gin, such as reduction in the weight of seed and increased waste due to damaged locks and bolls that could not be ginned, were estimated to average $2.69 per bale in the Lower Valley and $1.35 per bale in the counties above the Valley.

Losses in oil-mill products, such as reduced weight and value of the oil, meal, and linters, were estimated at $1,299,000.

Table 1. Estimated Losses to the 1952 Cotton Crop by the Pink Bollworm in the Heavily Infested Area of Southern Texas [1]

Number of Counties	Number of Acres	Number of Bales Produced	Reduction in Yield			Seed Loss and Waste at Gins	Loss in Oil Mill Products	Loss in Grade	Cost of Insecticides	Total Loss
			Percent	Number of Bales	Value					
LOWER VALLEY:										
4	632,000	315,763	16.9	64,220	$12,844,000	$ 849,000	$ 796,000	$221,000	$5,549,000	$20,259,000
ABOVE LOWER VALLEY:										
34	1,023,618	399,007	7.8	33,774	6,754,000	539,000	503,000	140,000	----	7,936,000
TOTAL										
38	1,655,618	714,770	12.1 [2]	97,994	$19,598,000	$1,388,000	$1,299,000	$361,000	$5,549,000	$28,195,000

[1] The losses were valued at the average prices in the area covered during October 1952 as reported by farmers, ginners, and others contacted.
[2] Weighted average.

Keep Fields Bug-Free in '53

Systemic Insecticides

"Although the field of systemic insecticides looks like a very promising one, we should certainly try to correct the impression that the 'systemic era' is at hand, and that the panacea for all our problems is just around the corner."

By E. E. IVY

E. E. IVY, Entomologist, Bureau of Entomology and Plant Quarantine, USDA, and Texas A. & M. College, College Station, read the accompanying paper at the Sixth Annual Cotton Insect Control Conference, Memphis, Dec. 10-11, 1952.

THERE IS considerable interest in the so-called systemic insecticides. The idea of insect control by injecting chemicals into infested plants is not a new one—in fact, for centuries it has repeatedly been picked up, dusted off, and tried out.

We all agree that the idea of controlling insects in inaccessible parts of the plant by pouring an insecticide on the soil, splashing a little on the leaves, or perhaps even treating the seed before planting, is a very appealing one. Then why don't we abandon our other recommendations for cotton-insect control and concentrate our efforts on this approach?

You are certainly entitled to an answer to that question. You also have the right to know just what the entomologists are doing about systemic insecticides. What are the possibilities for the use of these materials, and what are their limitations?

We have worked with systemic compounds for four years at the Basic Research Laboratory for Cotton Insect Control at College Station, Texas, operated jointly by the Texas Agricultural Experiment Station and the Bureau of Entomology and Plant Quarantine. We cooperate with manufacturers, in this country and in England and Germany, who are interested in developing these materials. We have screened hundreds of compounds for systemic activity. Dozens of systemic compounds have been found. Most have the same limitation insofar as cotton insect control is concerned. They do not kill cotton's insect enemy number 1, the boll weevil, or the possible successor to this title, the pink bollworm.

We have heard much about a systemic insecticide having the complicated chemical name of ethylmercaptoethyl diethyl thiophosphate. This chemical is available in a formulation more familiarly known to you as Systox. This product was sold for use on cotton this year for the first time. I understand that it did a wonderful job of controlling spider mites in the Pecos area of Texas and in California last year. This was in an area where the spider mite is notoriously difficult to control. One application, at the rate of ¼ to ½ pound per acre, as a foliage spray, carried the crop through the season. The product also has given excellent control of the cotton aphid. Systox will kill thrips and cotton leafworms by contact action, but it has no residual toxicity or systemic activity against these species, and therefore has no advantages not shared by other, less expensive, insecticides. Systox was not effective against the boll weevil or the pink bollworm.

What about octamethyl pyrophosphoramide (OMPA), or schradan, as it is now called? I understand that this compound has been used commercially to a limited extent on ornamental plants. No label has been granted for its use on cotton in this country. Schradan will kill aphids and spider mites. Our laboratory studies indicate that from two to four times as much schradan would be required as for Systox. Also, it will take two or three days for you to notice any results, because schardan has no contact action whatever, being purely a systemic insecticide.

In the case of some systemics the plant slowly converts the chemical into some other substance which actually kills the insect. Compounds in acting this way were termed "endo-metatoxic systemics" at the recent Paris Congress on Crop Protection. A study of phosphorus compounds that act in this way indicates that there is a high energy bond, or potential site of enzymatic association, in the portion of the molecule joined to phosphorus by an anhydride linkage. It might be of interest to point out that all toxic phosphorus compounds so far studied as systemics contain pentavalent phosphorus. Two of the valences are taken up by stable linkages to alkyl, alkoxy, or alkylamino groups. Two more are taken up by high energy linkage to oxygen or sulfur. The fifth, or anhydride, linkage appears to determine whether a phosphorus compound has endo-metatoxic systemic properties.

Acid anhydrides are powerful acetylating agents. It seems probable that, following association with a plant enzyme or other plant constituent, and following ingestion by an insect of plant sap containing the modified plant constituent, the acid anhydrides convey a substituted phosphoric acid residue to a vital insect enzyme and attach it to a site normally occupied by an unsubstituted phosphate.

Seven different types of potential enzyme-association sites have been found thus far to confer systemic activity upon a compound. In each of these seven types we have had opportunity to study only a few of the compounds that could be synthesized. More important still, entirely different types of association sites are constantly being found.

All this shows that research in systemic insecticides is in a very dynamic state, and there is no way of telling what the future might hold.

What are we doing to find a systemic insecticide to kill the boll weevil and the pink bollworm? For the last three years we have screened everything we could get our hands on at the College Station laboratory, trying to find an insecticide that would control boll weevils by systemic action. We now have half a dozen compounds that will kill boll weevils in this way. There are two difficulties. Most of these systemics which kill weevils are what were termed "endo-lithic systemics" at the recent Paris Congress on Crop Protection; that is, they are not metabolized by the plant but act as unchanged chemicals. Therefore, they are not translocated following application to the foliage. They may be translocated through the root, particularly an injured root, following soil application, or following application to the seed at time of planting. The second difficulty is that most of the chemicals that kill boll weevils injure the cotton plant or inhibit germination when used as seed treatments at dosages high enough to kill boll weevils.

We do have one compound that appears promising for boll weevil control by seed treatment. It remains to be seen whether it can be used safely. This is a confidential compound synthesized by Gerhard Schrader and designated only as L-11-6. The particular virtue of L-11-6 is the complete lack of phytotoxicity or inhibition of germination obtained when the seed is treated with as much as 4 pounds per 100 pounds of cottonseed. In some of our tests we used 16 pounds per 100 without injury, which would appear to give us a fairly safe tolerance. However, we have indications that injury is more pronounced at low temperatures. Studies are in progress with constant-temperature boxes to determine this point.

Laboratory studies indicate that on plants grown from seed treated with this compound weevils will be killed for approximately six weeks following germination. Thrips, aphids, spider mites, cotton fleahoppers, and several other pests are also controlled. We think this compound should be tested in the field at 4 pounds per 100 pounds of seed, or approximately 1 pound per acre. It is applied by preparing a 50 percent dust on activated carbon and mixing this with the seed at the time of planting. Treated

seed may also be stored for several months without injury to the seed or reduction in effectiveness of the compound.

We think that this compound may be useful wherever the early-season control program has been successful. Three applications of insecticide would thus be saved, and community participation would be expected to be better in this type of program than in a spray or dust program. The compound loses its effectiveness about the time the plant starts blooming; hence it could not be relied on to do the job throughout the season. On the other hand, the chemical would probably be gone from the plant at the time of harvest. Studies must be made to determine this point, however.

L-11-6 is reported to be quite toxic to warm-blooded animals. According to the last reports that we had, the manufacturer has no plans at present to develop this compound commercially. Instead, he is concentrating on the development of analogs of L-11-6 that will combine the insecticidal efficacy of L-11-6 with low mammalian toxicity. This development should be watched with a great deal of interest.

What about soil application? The answer is—the cost would probably be prohibitive for cotton. We have found that much larger dosages of a systemic compound are required for soil application than for foliage or seed treatment.

And finally, what are we doing to find a systemic insecticide that will kill the pink bollworm? We started a program on this project last April, at Brownsville, Texas. We screened 86 of our most promising phosphorus compounds against the pink bollworm. Eighteen compounds showed some degree of promise at a dosage level of 64 parts per million parts of green cotton boll. In these tests stems of bolls were placed in solutions containing the chemical for an hour or two, until all of a measured dose was taken up, and then they were infested with pink bollworm eggs. Examinations for surviving worms were made two weeks later.

Fourteen of the compounds killed 50 percent or more of the larvae at 32 parts of the insecticide per million parts of green cotton boll. Nine were effective at 16 parts per million, six killed at 8 parts per million, and three killed at 4 parts per million. Before we get too enthusiastic, however, I must tell you that the better systemics used for aphid and spider mite control act at 1 part per million, or even less.

On a more practical side, we took six of the more promising materials from the laboratory tests, and applied them as sprays to cotton growing in the field. Our rate of application was 2 pounds per acre, which we consider about the top dosage that could possibly be considered economically feasible. We infested a group of bolls daily with pink bollworm eggs. After two weeks we cut open these bolls and examined them for larvae. The results were very disappointing. None of the compounds gave satisfactory control even at this very high rate of application.

We also determined that plants grown from treated seed were ineffective against the pink bollworm. Also, soil application tests with as high as 16 pounds of insecticide per acre gave negative results.

So I'm afraid we must conclude that, even though we have tested many compounds for both systemic and contact action, we still haven't solved the pink bollworm problem. We still have many materials to test and there are others that may be synthesized for testing. Although the field of systemic insecticides looks like a very promising one, we should certainly try to correct the impression that the "systemic era" is at hand, and that the panacea for all our problems is just around the corner.

Headquarters for Crushers' National Meeting

SHOWN ABOVE is the world famous Ambassador Hotel in Los Angeles, where members of the National Cottonseed Products Association will gather for their annual convention, May 8-12. Many crushers, their families and representatives of allied industries are expected at the convention, and Association officials advise those who have not done so to make their reservations now.

• Cotton Improvement Pays in Alabama

The "Man on the Land" has cost the cotton textile industry in Alabama about $13,500,000—and the industry has been happy to pay the bill.

That was the comment of Joe L. Jennings, Lanett, president of the Alabama Cotton Manufacturers Association, at a recent luncheon meeting in Birmingham, honoring Alabama's cotton growers for their outstanding achievement in improving the quality and per-acre yield of cotton.

Jennings, who also is executive vice-president of the West Point Manufacturing Co., told the meeting that the "bill" represented the premiums paid growers "for superior quality and uniform character of the best grades of cotton that can be grown in our state."

Dr. Charles F. Simmons, associate dean, Alabama Polytechnic Institute School of Agriculture, related how farmers had made tremendous strides through the use of scientific farming methods. He was presented by H. E. Jeffery, Tuscaloosa, president of the Alabama-Florida Cottonseed Products Association. That association and the Alabama Cotton Manufacturers Association provide cash awards annually for winning communities in the Cotton Improvement Contest which is conducted by the API Extension Service.

Others taking part in the program included O. N. Andrews, Extension Service cotton improvement specialist, and Mary Elizabeth Gregory, Alabama's Maid of Cotton.

CALENDAR

Conventions • Meetings • Events

• March 23-24-25 — Arkansas-Missouri Ginners Association annual convention. Hotel Peabody, Memphis, Tenn. W. Kemper Bruton, Blytheville, Ark., executive vice-president. To be held concurrently with Midsouth Gin Supply Exhibit.

• March 23-24-25—Midsouth Gin Supply Exhibit. Midsouth Fairgrounds, Memphis, Tenn. For information, write W. Kemper Bruton, executive vice-president, Arkansas-Missouri Ginners Association, Blytheville, Ark. Arkansas-Missouri and Tennessee ginners' associations will hold annual conventions in connection with the Exhibit.

• March 23 - 24 - 25 — Tennessee Cotton Ginners Association annual convention. Hotel Peabody, Memphis, Tenn. W. T. Pigott, P. O. Box 226, Milan, Tenn., secretary-treasurer. To be held concurrently with Midsouth Gin Supply Exhibit.

• March 25-26—National Cotton Ginners Association annual meeting. Hotel Peabody, Memphis, Tenn. W. Kemper Bruton, Blytheville, Ark., executive vice-president.

• March 30-31 — Louisiana-Mississippi Cotton Ginners' Association annual convention. Hotel Vicksburg, Vicksburg, Miss. Gordon W. Marks, P. O. Box 1757, Jackson, Miss., secretary.

• April 6-7-8 — Texas Cotton Ginners' Association annual convention. State Fair Grounds, Dallas, Texas. Jay C. Stilley, 109 N. Second Ave., Dallas, Texas, executive vice-president.

• April 13-14 — National Cotton Compress and Cotton Warehouse Association annual convention. Roosevelt Hotel, New Orleans, La. For information write: Miss Louise Paine, National Cotton Compress and Cotton Warehouse Assn., 586 Shrine Bldg., Memphis, Tenn.

• April 13-14—Valley Oilseed Processors Association annual convention. Buena Vista Hotel, Biloxi, Miss. C. E. Garner, 1024 Exchange Bldg., Memphis, Tenn., secretary.

• April 15 — Oklahoma Gin Operators School. Altus, Okla. For information write: C. V. Phagan, Extension agricultural engineer, Oklahoma A. & M. College, Stillwater.

• April 20 - 28 — 1953 Gin Operators Schools for Tennessee, Arkansas and Missouri ginners. Memphis, Tenn. April 20-21, Continental School. April 22-23, Murray - Mitchell School. April 24 - 25, Lummus School. April 27-28, Hardwicke-Etter School. For information Arkansas and Missouri ginners write: W. Kemper Bruton, executive vice-president, Arkansas-Missouri Ginners' Assn., Blytheville, Ark., or Tennesssee ginners write E. K. Boyd, president, Tennessee Ginners' Association, Bolivar, Tenn.

• April 20 - 25 — 1953 Gin Operators Schools for Arkansas and Missouri ginners. Memphis, Tenn. April 20-21, Continental School. April 22-23, Murray School. April 24-25, Lummus School. April 27-28, Hardwicke-Etter School. Additional dates to be announced later. For information write: W. Kemper Bruton, executive vice - president, Arkansas - Missouri Cotton Ginners' Assn., Blytheville, Ark.

• May 4-5-6 — American Oil Chemists' Society forty - fourth annual meeting. Roosevelt Hotel, New Orleans, La. Lucy R. Hawkins, 35 East Wacker Drive, Chicago, executive secretary.

• May 8-12—National Cottonseed Products Association, fifty - seventh annual convention. Ambassador Hotel, Los Angeles, Calif. S. M. Harmon, 19 South Cleveland Street, Memphis, secretary-treasurer.

• May 4 - 16 — Texas Gin Operators Schools, Dallas. For additional information, write Ed Bush, Extension Cotton Ginning Specialist, Texas A. & M. College, College Station.

• May 18 - 19 — Oklahoma Cottonseed Crushers' Association annual convention. Lake Murray Lodge, Ardmore, Okla. J. D. Fleming, 1004 Cravens Bldg., Oklahoma City, Okla., secretary.

• June 1-2—Alabama-Florida Cottonseed Products Association-Georgia Cottonseed Crushers Association joint annual convention. Edgewater Gulf Hotel, Edgewater Park, Miss. J. E. Moses, 318 Grand Theatre Bldg., Atlanta, Ga., secretary, Georgia association; T. R. Cain, 322 Professional Center Bldg., Montgomery, Ala., executive secretary, Alabama-Florida association.

• June 3-4-5—Tri-States Oil Mill Superintendents' Association, twenty - eighth annual convention. Peabody Hotel, Memphis, Tenn. L. E. Roberts, DeSoto Oil Company, Memphis, secretary-treasurer.

• June 7-9—Texas Cottonseed Crushers' Association fifty - ninth annual convention. Shamrock Hotel, Houston, Texas. Jack Whetstone, 624 Wilson Bldg., Dallas 1, Texas, secretary.

• June 8 - 9 — North Carolina Cottonseed Crushers Association - South Carolina Cottonseed Crushers' Association joint annual convention. The Grove Park Inn, Asheville, N. C. Mrs. M. U. Hogue, P. O. Box 747, Raleigh, N. C., secretary-treasurer, North Carolina association; Mrs. Durrett L. Williams, 609 Palmetto Bldg., Columbia, S. C., secretary-treasurer, South Carolina association.

• June 10-11-12—National Oil Mill Superintendents Association annual convention. Texas Hotel, Fort Worth. H. E. Wilson, Wharton, Texas, secretary-treasurer.

• June 10-11-12—Mississippi Cottonseed Crushers Association forty-fourth annual convention. Edgewater Gulf Hotel, Edgewater Park, Miss. J. A. Rogers, P. O. Box 3581, West Jackson Station, Jackson 7, Miss., secretary.

• June 25-26-27 — Fourteenth Annual American Cotton Congress. Lubbock, Texas. Sponsored by Statewide Cotton Committee of Texas. Burris C. Jackson, Hillsboro, general chairman.

Swann Improving, Thanks Friends for Interest

G. E. Swann, Dallas district manager, Waukesha Sales & Service, Inc., is improving each day from the injuries he suffered in a Feb. 10 auto accident, Mrs. Swann reports in a letter asking The Cotton Gin and Oil Mill Press to express appreciation to his friends in the industry for their interest. As previously reported, he is at Providence Hospital, Waco.

Call in Authorities If Disease Occurs

Crushers and ginners who hear of outbreaks of disease among livestock in their area will render a service to their own industry and the livestock industry by seeing that a competent veterinarian or disease control authority is called to establish the true cause of the difficulty. Unless this is done, the disease may be blamed on cottonseed feed products or other feeds which may not be involved.

An outbreak of X-disease in various parts of Texas in recent weeks has caused serious concern among cattlemen and feed producers. A number of different feeds have been suspected and it has been found that some foreign material has come in contact with the feeds and caused the difficulty. Dr. H. Schmidt, College Station, Texas, Experiment Station veterinarian, has said: "The outbreak has been traced to chlorinated napthalene. Chlorinated napthalene is an additive to certain lubricating oils and also has been detected in tractor greases."

It has definitely been established that the cause of the trouble is a material other than the feeds themselves. This fact, and the relatively limited knowledge about X-disease, or hyperkeratosis, make it highly important that crushers and ginners help stockmen get competent assistance when the disease occurs. This will help to maintain the good reputation of well-established, proven feed products such as cottonseed meal, cake and pellets.

• Superintendents to Meet March 21-22

OIL MILL SUPERINTENDENTS of the West Coast area will meet March 21-22 in San Francisco for an outstanding business program and entertainment features at the divisional meeting of the National Oil Mill Superintendents Association. H. F. Crossno, Los Angeles, is chairman for the meeting.

Solvent extraction, pre-pressing, seed cleaning, odors in cottonseed processing and other subjects will be discussed by oil mill superintendents and representatives from allied industries.

Ginning Unusually Late In South Carolina

With the cotton harvest unusually late this season in the Springfield area of South Carolina, Foy Gin and Bennett Gin were still in operation at the end of February. Wardlaw Foy recalls that 1946 also was an unusually late season, with his gin still ginning cotton in April, 1947, while the field across the road from it was being planted for the 1947 crop.

■ **R. T. DOUGHTIE, Jr., Memphis, who is in charge of the supervision of USDA's cottonseed grading, was a recent visitor at The Cotton Gin and Oil Mill Press office.**

Keep Fields Bug-Free in '53

Defoliation: Promising Aid In Controlling Insects

"The practice of cotton defoliation will give the grower the maximum benefit from his insecticide program and as near as possible year-round insect control."

By E. W. DUNNAM
A. J. CHAPMAN
and H. R. CARNS

E. W. DUNNAM, Entomologist with the Bureau of Entomology and Plant Quarantine, USDA, Stoneville, Miss., read the accompaying paper at the Sixth Annual Cotton Insect Control Conference, Memphis, Dec. 10-11, 1952.

THE FIRST intentional defoliation of cotton of which we have record was in 1938 by E. E. Hall, superintendent of the Pee Dee Agricultural Experiment Station at Florence, S. C. He used fertilizer grade cynamide to remove leaves on rank plants to prevent bottom boll rot.

In 1942 at Stoneville, Miss., dusting-grade calcium cynamide was applied to mature cotton to test whether chemical defoliation was feasible. Continued investigations with this and other types of chemical defoliants soon showed not only that defoliation was important in the preparation of the crop for mechanical harvesting, but that it also reduced the populations of insect pests.

The cotton aphid was the first pest observed to be destroyed when leaves were removed by the application of a defoliant. Subsequently, it was observed that, when heavy infestations developed on cotton late in the season and threatened to spoil the grade by honeydew secretions, complete defoliation was effective in preventing it. Doubtless other sucking insects, such as the tarnished plant bug, the rapid plant bug, and stink bugs, were disturbed and left the fields, because none could be found in completely defoliated cotton.

Cotton leafworm infestations were brought under control when fields were defoliated. Most of the larvae half-grown or smaller were killed by coming in contact with the defoliant, and the larger ones immediately ceased feeding. Therefore, excessive pin trash that is not removed with standard gins and staining of the lint usually caused by excrement were practically eliminated.

When oportunity permitted, bollworm and tobacco budworm infestations following defoliation were recorded from year to year. It was observed that when leaves and young squares bearing eggs dropped to the ground the hatching larvae created no infestation. Partially exposed larvae feeding in bolls turned very dark and apparently started disintegrating in a very few days; eventually they were all destroyed.

Early efforts were concentrated on developing an economical method of removing all cotton leaves without killing the plant. However, studies revealed the dificulty of doing an ideal job under all conditions. Its success was influenced by a number of factors. In some fields the treated cotton developed a new crop of leaves and squares.

Since the boll weevil was the major

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H. R. CARNS is Plant Physiologist, Bureau of Plant Industry, Soils, and Agricultural Engineering, USDA, Stoneville, Miss.

pest infesting cotton at the beginning of this study, large numbers of second-growth squares developing after plants had been defoliated, regardless of date, were examined for weevil grubs. Under most favorable conditions of second growth where the squares became infested no grubs were found to develop to the pupal stage before a killing frost. Therefore, the age of all adult weevils to go into hibernation dated back to before the plants were defoliated. Although defoliation was of considerable value in impeding weevil multiplication, it was not always so effective in cutting off all weevil food as was cutting and turning under all stalks. However, the cotton could be defoliated much earlier in the season without a reduction in yield.

In the spring of 1947 boll weevil population studies were made in seedling cotton in fields that had been defoliated early in the fall of 1946. Not a weevil was found in 12 such fields, whereas an examination of an equal number of adjacent fields that had not been defoliated the previous fall revealed that 6 were infested with an average of 116 weevils per acre, or an average of 58 in all fields examined.

The continued infestation of new areas by the pink bollworm constitutes a very serious problem for cotton growers not only of Texas and adjoining states, but of the entire South.

It has been found that chemical defoliation of cotton will suppress a pink bollworm infestation and reduce the crop losses from this insect. The pink bollworm, unlike the boll weevil, prefers to attack green bolls rather than squares. The longer the green bolls are on the plants the more heavily infested they become. Chemical defoliation of cotton accelerates the opening of the green bolls and thereby reduces the build-up in the pink bollworm population and the amount of boll damage.

When they have completed their feeding in the green bolls, most of the pink bollworms cut exit holes through the carpel and drop to the soil to pupate. In wet weather these exit holes permit the entrance of moisture and decay organisms, with consequent rotting of the bolls.

Most of the crop loss from boll rot can be reduced by defoliating the cotton. Chemical defoliation in hot, dry weather allows better heating of the soil, and many of the pink bollworms that drop to the ground for pupation are killed by the high soil-surface temperature.

Defoliation also reduces the pink bollworm carryover from one year to the next. Field observations have shown that hastening the maturity of the crop by defoliation decreases the number of hibernating larvae. Hibernation studies in southern Texas have shown that the earlier the stalks are destroyed and the crop debris is plowed under the lower is the pink bollworm survival. State regulations require that all stalks in this area be destroyed by a specified date. Chemical defoliation is of great help to the cotton growers in meeting the stalk-destruction deadline.

The regrowth and fruiting of cotton following defoliation is a menace from the viewpoint of pink bollworm control. After the cotton is defoliated, rain or other causes sometimes delay the harvesting of the crop and the destruction of stalks. The regrowth and fruiting under these conditions serve in building up a late seasonal pink bollworm population. The development of pink bollworms at this time is particularly hazardous, since a higher percentage is likely to be carried over into the next crop.

Investigations were conducted with various herbicides and defoliants during the 1952 season under the direction of A. J. Chapman, Brownsville, Texas, and the speaker (E. W. Dunnam) at Stoneville, Miss. in an effort to find a material that would either kill the cotton plants or inhibit their regrowth and fruiting. A total of 55 formulations was tested in Mexico and southern Texas, and 13 were tested at two or three strengths in Mississippi. None of the formulations killed all the stalks. An occasional plant was killed with sodium arsenite, but there are a number of objections to the use of this material. All the commonly known defoliants stopped fruiting and hastened the opening of the bolls. A formulation containing approximately 4 percent of pentachlorophenol in diesel oil was effective under a wider range of conditions than other defoliants.

In areas other than those in which the pink bollworm is a problem, where cotton growth is relatively rank as a result of adequate moisture, irrigation, and high fertility, a true chemical defoliant, one which will remove all or most of the leaves in the cotton field, appears to be the most advantageous. Under these conditions, however, one is all too often faced with the problem of regrowth following defoliation, with sufficient green material to support the insect population. There is a need for the development of chemicals or methods that will inhibit or remove this new growth when the true defoliants are used.

Another type of chemical that appears to be required should properly be called not a defoliant, but rather a desiccant. It should be a highly phytotoxic material that will cause incidental defoliation but its principal action is that of killing or drying the remaining leafy plant material in the field. This type of chemical is urgently needed in areas infested with the pink bollworm, but it can also be used advantageously in other places where the cotton plants are small and toughened as a result of growth under drouth or semi-arid conditions. Such conditions normally cause a large amount of leaf drop, and the toughened leaves remaining on the plant resist the action of the true defoliants. Such a chemical may also be useful in areas where failure to prevent insect damage has implemented vegetative growth at the expense of boll production. Leaves on such plants are physiologically immature and, like regrowth, are very difficult to remove. Compounds available at the present time do not always measure up to these requirements, but when the defoliants and desiccants are properly applied many of the benefits that have discussed heretofore may be realized.

From an insect-control standpoint either of these two types of materials should be applied as early as possible after the boll load has been set. However, the timing must be determined in accordance with plant conditions rather than entirely in relation to the requirements for best insect control.

Defoliation investigations by industrial and experiment station personnel indicate that the best grades and the highest color and luster of lint are obtained from bolls most recently opened prior to picking. It has been well established that the opening of mature bolls is accelerated by the action of the defoliant. It is also well established that defoliants, and particularly the desiccants, will open many immature bolls.

Investigations conducted over the Cotton Belt and reported by the Beltwide Cotton Defoliation Conference indicate that damage is likely to occur to fiber and seed of any bolls that are younger than 30 days of age at the time of application. In certain areas and seasons it is more likely that bolls must be 35 days old to escape damage. The ideal time for the application of the defoliant would therefore appear to be governed mainly by the age of the bolls which the grower expects to mature in his crop. However, the actual date chosen will be a compromise with the existing environmental conditions, the moisture and maturity status of the plant and the insect-control benefits all entering into the choice of a proper time.

Picking should be undertaken as soon as possible after leaf fall and followed immediately by stalk destruction. A stalk shredder is presently available which can be attached to the mechanical harvester. By its use there will be no time lag or extra operation.

The practice of cotton defoliation will give the grower the maximum benefit from his insecticide program and as near as possible, year-round insect control.

State Guides

(Continued from page 83)

taken. In the flower sampling method, treatment is indicated when an average of 5 percent of the white blossoms show typical **Lygus** injury plus the presence of **Lygus** bugs. **Lygus** injured flowers show crinkled and warty surfaces of the petals and brown spots on the inner floral parts.

• **Bollworm or Corn Earworm**—This insect has developed into one of the most important pests of cotton in California. Bollworm presence may be detected by the characteristic feeding injury on the tiny new leaves at the crown of the plant as well as by the holes found in squares and young bolls and the webbing containing small light-brown droppings accompanying the injury. Many of the damaged small squares drop or are easily swept from the plant. When sweeping for **Lygus** the debris in the net should always be carefully examined for bollworms and injured squares. Frequently the bracts on larger damaged squares become flared and turn yellowish. Fields should be inspected frequently and when damage is detected, careful examinations should be made. Such injury should be traced through successive squares, flowers and bolls. When an average of four or more small live worms are found in 100 plants treatment should be made. Frequently the injury is found, but due to predator activity or other factors the worms are not present and treatment is unnecessary. Since large worms feed within the bolls and are difficult to control, treatments should be timed to kill

the small worms. Another infestation may occur within two to three weeks after treatment.

• **Thrips and Cowpea Aphids on Young Cotton** — Cotton plants usually recover from damage by these pests and control is not recommended unless loss of stand is threatened.

• **Cotton Aphids**—This aphid may stunt young plants and reduce yields. Infestations may be kept from becoming widespread by spot dusting with nicotine in warm calm weather. Near harvest time the cotton aphid may become so numerous that the honeydew on the fiber reduces quality and interferes with picking, ginning and spinning. Treatment should not be made until aphids are present, but should be made before the lint is damaged.

• **White Flies** — This pest is more important in the desert regions but treatment is seldom necessary as they are usually controlled by parasites. If control is necessary, repeated applications

CALIFORNIA Recommendations for 1953

Insect	Time of Injury	CONTROL MEASURES: Dust—Pounds Per Acre: Ground	Dust—Pounds Per Acre: Airplane	Spray—Toxicant Per Acre: Ground	Spray—Toxicant Per Acre: Airplane	REMARKS
Atlantic Pacific Two-spotted Mites	Entire Season					Cultural methods: Burn or destroy weeds adjacent to field before planting and throughout season.
		3% Aramite 30 lbs.	3% Aramite 35-40 lbs.	1 lb. Aramite		Use as soon as mites appear. Thorough coverage essential. Repeat applications may be necessary.
		7.5-10% Ovotran 30 lbs.	7.5-10% Ovotran 35-40 lbs.	2 lbs.-3 lbs. Ovotran		
		98% Sulfur 25-30 lbs.	98% Sulfur 30-35 lbs.			When mites appear repeat at 10-day intervals. Least effective on the two-spotted mite.
				Systox 4-6 ozs.	Systox 4-6 ozs.	One application usually sufficient.
Cutworms	Seedling					Oil-Bran-DDT Bait—80% Bran, 11% Oil and 8-9% of a 25% emulsifiable DDT, 15-20 lbs. per acre.
		10% DDT 20-25 lbs.	10% DDT 25-30 lbs.	1.5 lbs. DDT	2 lbs. DDT	Ground application preferred. Apply along crop row. Irrigation frequently drives worms to surface. Spray preferred.
		10% Toxaphene 30 lbs.	10% Toxaphene 30-35 lbs.	3 lbs. Toxaphene	3-4 lbs. Toxaphene	
Beet Armyworm Darkling Ground Beetles	Seedling	5% DDT 15-20 lbs.	5% DDT 25-30 lbs.	1 lb. DDT	1.25-1.5 lbs. DDT	Ground application preferred for darkling ground beetle.
Sphinx Moth Hornworms	Seedling	5% DDT 20 lbs	5% DDT 25-30 lbs.	1 lb. DDT	1.25 lbs. DDT	Occasional pest. Barriers of 10% DDT or 20% Toxaphene will stop migration.
Thrips	Early					Control not recommended. See notes.
Yellow-Striped Armyworms	June to October	5% DDT 20-25 lbs.	5% DDT 25-30 lbs.	1 lb. DDT	1.25-1.50 lbs. DDT	Barrier strips of 5% DDT. (Pest in the San Joaquin Valley only.)
Lygus Bug Fleahoppers Leafhoppers Leaf Perforator Bean Thrips	June to last of August	5% DDT + 50% Sulfur 25-30 lbs.	5% DDT + 50% Sulfur 30-35 lbs.	1 lb. DDT	1.25-1.50 lbs. DDT	Treat when an average of 10 lygus per 50 sweeps, each nymph counting as two, or when 5% of white blossoms damaged. (See note) Toxaphene for lygus bug only. (Leaf perforator in desert area.)
		10% Toxaphene + 50% Sulfur 25-30 lbs.	10% Toxaphene + 50% Sulfur 30-35 lbs.	2-3 lbs. Toxaphene	3 lbs. Toxaphene	
Bollworm	Midseason to harvest	10% DDT + 50% Sulfur 25-30 lbs.	10% DDT + 50% Sulfur 30-35 lbs.	1.50 lbs. DDT	2 lbs. DDT	For interior desert regions, treat when worms are found at the rate of one per 25 plants (See note.)
		5% DDT + 75% Sulfur 20-25 lbs.	5% DDT + 75% Sulfur 25-40 lbs.	1 lb. DDT	1-1.5 lbs. DDT	For San Joaquin Valley, treat when worms are found at the rate of one per 25 plants. (See note.)
Cotton Aphid	Throughout season, more severe in late season (See Note)				Systox 3 ozs.	Mid to late season—long residual. (See warning.)
		2% BHC 25-30 lbs.	2% BHC 30 lbs.			For desert regions. Cannot be used on land which will be in root crops within two years. Do not use if bees in vicinity.
		Early to mid-season Nicotine No. 8 or No. 10 25 lbs.				San Joaquin only.
					TEPP 1 qt. of 20%	
Stink Bug	Mid to Late season	2% BHC + 50% Sulfur 25-30 lbs.	2% BHC + 50% Sulfur 30-35 lbs.	0.5 lb. Gamma BHC	0.5 lb. Gamma BHC	A problem mostly in desert regions. BHC should not be applied to land which will be planted to root crops within two years. Do not use Dieldrin or BHC when bees are present.
				0.5 lb. Dieldrin	0.5 lb. Dieldrin	
Lygus Bug Bollworm Stink Bug Aphids	Mid to Late season	2% BHC + 10% DDT + 50% Sulfur 20-25 lbs.	2% BHC + 10% DDT + 50% Sulfur 25-30 lbs.	0.4 lb. Gamma BHC 1.5 lbs. DDT	0.6 lb. Gamma BHC + 2 lbs. DDT	Dust preferred. This combination of pests occurs mostly in desert regions. Should not be used if land will be planted to root crops within 2 years or if there is a hazard to bees.
Salt Marsh Caterpillar Cabbage Loopers	Late season	5% DDT + 15% Toxaphene + 40% Sulfur 20-25 lbs.	5% DDT + 15% Toxaphene + 40% Sulfur 25-30 lbs.	3-4 lbs. Toxaphene	4-5 lbs. Toxaphene	Occasional pests.
Grasshoppers	Early season	10% Toxaphene 25 lbs.	10% Toxaphene 30 lbs.	2.5 lbs. Toxaphene	3 lbs. Toxaphene	Occasional pests. Chlordane and Dieldrin hazardous to bees. Sprays preferred when bees in vicinity.
		5% Chlordane 20 lbs.	5% Chlordane 25 lbs.	1 lb. Chlordane	1 lb. Chlordane	
				3 ozs. Aldrin 0.25 lbs. Dieldrin	4 ozs. Aldrin 0.25 lbs. Dieldrin	
Seed-corn Maggot Wireworm	Seedling	SEED TREATMENT				2.66 ozs. 75% lindane per 100 lbs. seed. Slurry on with fungicide.
Nematodes	Throughout Season Treat before or at planting	Soil Fumigation				Soil must be in good seed bed condition at time of fumigation.
		Complete treatment	DD — 20 gals. per A or EDBW85—4.5 gals. per A		12" spacing 8"-12" deep	Fumigant may be applied before or at seeding time.
						Crop Rotation.
		Bed treatment	DD — 8-10 gals. per A or EDBW85—2.5 gals. per A		Two chisels per Bed 9" space 8"-12" deep	Summer fallow with turning land 3-4 times promising.

of parathion at weekly intervals will give protection.

Insecticides and miticides should not be purchased and stored before the season begins. Some materials deteriorate in storage and are not effective when applied. Only freshly mixed materials should be used.

•**WARNING!** — Systox, Parathion and other phosphates included herein are hazardous materials, and permits for their use must be obtained from the Agricultural Commissioner. Most insecticides are poisons and all precautions for their use and storage should be carefully followed.

1953 Cotton Insect Control Recommendations for:

Georgia

• **Five Rules for Successful Cotton Insect Control**—(1) Inspect fields at least once a week—know the kind and degree of insect damage in your cotton at all times. (2) Use the proper insecticide for the insect or insects you wish to control. (3) Be sure that applications of insecticides are thorough. (4) Apply insecticides at the right time and at the proper interval. (5) Don't stop your control program too soon.

How to Make Infestation Counts

Periodic inspections of cotton fields must be made in order to time applications of insecticides properly for effective and economical control of cotton insects. It is the responsibility of the individual farmer to make these inspections. In general, insect infestation counts should be made every 5 to 7 days. During periods of heavy insect infestations more frequent inspections are advisable.

• **Boll Weevil — (1) Presquare counts:** inspections of seedling cotton should be made after chopping to determine the abundance of overwintered weevils. Examine 100 plants for every 5 acres of cotton and observe the number of live adult weevils present. To obtain the approximate number of boll weevils per acre, multiply the number found per 100 plants by 200. Watch for other insects and damage while making boll weevil counts.

(2) **Punctured square counts:** Square counts should be started when there is an average of 3 to 4 squares per plant. Walk diagonally across the field pulling healthy, unflared squares equally from the upper, middle, and lower parts of the plants until 100 squares have been pulled. Do not pull more than one square from a plant. Squares smaller than an ordinary pencil eraser should not be picked. The number of punctured squares found is the percent punctured squares or the percent infestation. At least 100 squares should be examined for each 5 acres of cotton.

• **Bollworm**—Walk diagonally across the field and examine the terminals (buds) of 100 plants. Look closely for bollworm eggs and small worms on both sides of the young leaves, on the stems, and on the small squares in the upper 3 or 4 inches of the plant. The bollworm egg is about half the size of a pinhead and pearly-white to dirty gray in color. The newly hatched worms are very tiny and close observation is necessary to find them.

Examine at least 100 plant terminals for each 5 acres of cotton. Control measures should begin when eggs and 4 to 5 worms are found per 100 terminals.

INSECTS

• **Boll Weevil**—The boll weevil is the most serious insect pest of cotton in Georgia. Early season control programs should include at least one application for the control of the overwintered weevils. This application should be applied just before the oldest squares are large enough for the laying of eggs. Boll weevils prefer squares the size of an ordinary pencil eraser or larger for egg-laying purposes. If weevils are controlled before the squares reach this size, the mid-season build-up of weevils in a field is often considerably delayed and sometimes prevented. Community-wide control is of great benefit.

Mid-season boll weevil applications should be started when the infestation reaches or exceeds 10 percent punctured squares. At least 3 or 4 appliations at 5-day intervals are needed to control a weevil infestation. If the infestation builds up again to exceed 10 percent punctured squares, another series of 3 or 4 applications at 5-day intervals must be started.

Boll weevils migrate late in the season when squares and young bolls become scarce. At this time, large numbers of weevils may move into fields every day. During this period it is essential that heavy and thorough applications of insecticides be kept on the cotton in order to prevent serious damage to the bolls. It may become necessary to reduce the interval between applications to 4 days

to obtain adequate protection during a heavy migration of weevils.

• **Bollworm** — The bollworm is a very destructive pest, and perhaps the most difficult to control of all the cotton insects in Georgia. Farmers must learn to find and recognize the eggs and small worms so that insecticides can be applied while good control is still possible. It is very difficult, if not impossible, to obtain adequate control after the worms are large and have entered the bolls. Bollworm control should be started when eggs and 4 or 5 small worms are found per 100 terminals (plant buds). (If only eggs are present, inspect every two days until worms are found). Apply insecticides every 4 or 5 days for bollworm control until eggs and small worms are no longer found.

• **Thrips** — Thrips damage cotton by rasping and sucking juices from the tender leaves and buds of seedling cotton. This causes the cotton to have a stunted, ragged appearance, and the undersides of the leaves to be silvery. The control of thrips helps cotton to get off to a good start and often hastens fruiting and maturity.

Due to the very small size of thrips, their damage is usually done before they are noticed. For this reason, it is considered good insurance to apply at least one application for thrips control as soon as the cotton is chopped.

• **Aphids**—These small, sucking insects are often called "plant lice." They are usually found on the undersides of the leaves and clustered around the tender branches of the bud. Aphids are capable of causing curling and distortion of the leaves and stunting of the plant. They secrete a sweet, sticky substance called "honey-dew" which damages the lint when it falls on open bolls.

Aphids usually do not build up to damaging infestations unless weather conditions are particularly favorable or unless an insecticide such as calcium arsenate or DDT is used alone.

• **Red Spider Mites**—These tiny pests are not true insects but are more closely related to ticks. They injure cotton by sucking juices from the undersides of the leaves and thereby cause the leaves to take on a yellow, rusty appearance, and finally a reddish color. Hot, dry weather favors a build-up of red spider mites. A heavy infestation is capable of defoliating the plants.

• **Cutworms** — Cutworms usually feed during the night and crawl down into loose soil to hide during the day. Plants cut off at or near the soil line, or cut off plant parts are signs that cutworms are at work. These insects can cause serious damage to cotton stands in the seedling stage.

• **Flea Beetles** — These tiny, jumping beetles feed on the leaves of the cotton plant causing small holes or blotches on the leaves. Flea beetles usually attack cotton early in the season and are capable of causing serious damage. These insects are easily controlled, however, and cotton should be watched closely so that this damage can be prevented.

• **Fleahoppers**—These are small, active bugs that suck the juices from tiny squares. Such squares die, turn brown, and may or may not fall from the plant. This insect is easily controlled by an early-season program.

• **Fall Armyworms**—These insects some-

times invade cotton, usually late in the season. They feed on the foliage, squares and bolls. Armyworms are controlled by the insecticides recommended for bollworm control.

• **Grasshoppers** — Grasshoppers seldom cause appreciable damage to cotton in Georgia. Toxaphene, aldrin, dieldrin, and heptachlor, as recommended for the boll weevil, will control these insects. Chlordane at the rate of 1 to 1½ pounds of the active ingredient per acre also will control grasshoppers.

• **Leafworms**—These insects do not often appear in Georgia until the cotton crop is mature. If it should become necessary to control these insects, use one of the following insecticides: calcium arsenate, or 3 percent gamma BHC — 5 percent DDT, or 20 percent toxaphene as dusts; or BHC-DDT, or toxaphene, or toxaphene-DDT as sprays. Apply dusts or sprays at the same rate as given in the chart for boll weevil control.

EARLY SEASON CONTROL

The early control of thrips, flea beetles, fleahoppers, and overwintered boll weevils enables cotton to get a good start and often hastens fruiting and maturity. The mid-season build-up of weevils may also be delayed or even prevented. **Community action will greatly increase the value of an early season control program.**

Two to four applications of insecticide at 7- to 10-day intervals are usually needed for a complete early season control program. The first application should be applied when the cotton is in the 2-to 4-leaf stage or just after chopping is completed. This application is usually for the control of thrips and should be applied at the low dosage given in the control chart. The second application is optional and should be applied if thrips, flea beetles or other insects are causing damage. The next application should be primarily for the control of overwintered boll weevils and the maximum dosage of insecticide listed in the early-season chart should be used. Of course, this application will also control thrips, fleahoppers and flea beetles if these insects are present.

Due to seasonal and insect conditions a fourth application is sometimes advisable. Be sure that a weevil application is made just before squares are large enough for egg-laying. The control chart also lists control measures for special early-season insect problems such as cutworms and aphids. An insecticide for the control of these insects can be selected that will also control the other early-

GEORGIA Recommendations for 1953

Early-Season Program

Insects	Dusts (Amount finished dust per acre)		Sprays (Amount active ingredient per acre)		Application
Cutworms	20% toxaphene	10 to 15 lbs.	toxaphene	2 to 3 lbs.	As needed.
	or		or		
	10% DDT*	10 to 15 lbs.	toxaphene plus DDT	2 lbs. ½ to 1 lb.	
			or		
			DDT*	1 to 1½ lbs.	
Thrips, flea beetles, and fleahoppers	3% BHC (gamma)	7 to 10 lbs.	toxaphene	3/4 lb.	Begin at 4-leaf stage or earlier; 2 to 4 applications at 7- to 10-day intervals.
	or		or		
	20% toxaphene	7 to 10 lbs.	aldrin	1/8 lb.	
	or		or		
	2½% aldrin	7 to 10 lbs.	dieldrin	1/10 lb.	
	or		or		
	1½% dieldrin	7 to 10 lbs.	heptachlor	1/8 lb.	
	or		or		
	2½% heptachlor	7 to 10 lbs.	DDT*	1/2 lb.	
	or		or		
	5% DDT*	7 to 10 lbs.	BHC (gamma)	1/6 lb.	
Overwintered boll weevils, thrips, flea beetles, and fleahoppers	3% BHC (gamma)	7 to 10 lbs.	toxaphene	3/4 to 1½ lbs.	Begin at 4-leaf stage or earlier; 2 to 4 applications at 7- to 10-day intervals. For boll weevil, use maximum dose listed.
	or		or		
	20% toxaphene	7 to 10 lbs.	aldrin	1/8 to 1/4 lb.	
	or		or		
	2½% aldrin	7 to 10 lbs.	dieldrin	1/10 to 1/5 lb.	
	or		or		
	1½% dieldrin	7 to 10 lbs.	heptachlor	1/8 to 1/4 lb.	
	or		or		
	2½% heptachlor	7 to 10 lbs.	BHC (gamma)	1/6 to 1/3 lb.	
Aphids (plant lice)	3% BHC (gamma)	10 to 15 lbs.	BHC (gamma)	1/3 lb.	As needed. Parathion or TEPP can be added to other sprays when needed for aphid control. (See precautions).
	or		or		
	1% parathion	10 to 15 lbs.	parathion	1/8 lb.	
			or		
			40% TEPP	1/2 pint	

Mid- and Late-Season Program

Boll weevils	3% BHC (gamma)-5% DDT, 10 to 15 lbs.		toxaphene	2 to 3 lbs.	When infestation reaches 10% punctured squares, make **at least** 3 applications at 5-day intervals. Additional applications should be made at 5-day intervals when infestation again rises to 10% or above.
	or		or		
	20% toxaphene	10 to 15 lbs.	toxaphene plus DDT	2 to 3 lbs. 1/2 to 1 lb.	
	or		or		
	2½% aldrin-5% DDT	10 to 15 lbs.	aldrin	1/4 to 1/2 lb.	
	or		plus DDT	1/2 to 1 lb.	
	1½% dieldrin-5% DDT	10 to 15 lbs.	or		
	or		dieldrin	1/6 to 1/4 lb.	
	2½% heptachlor-5% DDT, 10 to 15 lbs.		plus DDT	1/2 to 1 lb.	
	or		or		
	lime-free calcium arsenate, plus		heptachlor	1/4 to 1/2 lb.	
	1% parathion	10 to 15 lbs.	plus DDT	1/2 to 1 lb.	
	or		or		
	Alternate applications of 3% BHC (gamma)-5% DDT and regular calcium arsenate	10 to 15 lbs.	BHC (gamma) plus DDT	1/3 to 1/2 lb. 1/2 to 1 lb.	
Bollworms	Use any of the dusts listed above for boll weevils (with the exception of calcium arsenate), 10 to 15 lbs. For heavy infestations increase dosage to 15 to 20 lbs.; or use a mixture containing 10% DDT, or use straight 10% DDT.*		Use any of the mixtures listed above for boll weevils at the maximum amount given. (For heavy infestations use toxaphene-DDT (2-1) at 3 lbs.; or add DDT to other mixtures to give 1 lb. DDT per acre, or use straight DDT at 1 to 1½ lbs.*		When bollworm eggs and 4 or 5 small worms are found per 100 terminals, apply insecticides at 4- or 5-day intervals until control is obtained.
Aphids (plant lice)	3% BHC (gamma)-5% DDT, 10 to 15 lbs.		BHC (gamma) plus DDT	1/3 to 1/2 lb. 1/2 to 1 lb.	When honey-dew is noticed on the leaves. Parathion or TEPP can be added to other sprays when needed for aphid control. (See precautions).
	or		or		
	1% parathion	10 to 15 lbs.	parathion	1/8 to 1/4 lb.	
			or		
			40% TEPP	1/2 pint	
Red spider mites	1% parathion	10 to 15 lbs.	parathion	1/8 to 1/4 lb.	When leaves take on a rusty appearance and mites are found. Parathion (See precautions) and aramite can be added to other sprays when needed for red spider mite control.
	or		or		
	3% aramite	10 to 20 lbs.	aramite	1/3 to 2/3 lb.	
	or				
	sulfur	20 to 30 lbs.			

*When DDT is applied alone, no weevil control is obtained and heavy aphid infestations are likely to build up.

season pests. Therefore, an application for the control of cutworms or aphids can be substituted for one of the regular early-season applications if the proper insecticide is used.

MID- AND LATE-SEASON CONTROL

The time to begin mid-season applications is determined by the kind and numbers of insects present. Read carefully the section of this article on **How to Make Infestation Counts.** The number of insects or the amount of damage necessary to justify the application of insecticides is given in the control chart and further discussed in the paragraphs on the individual insects.

No one can accurately predict the exact number of applications that will be necessary to control cotton insects during any one year. Farmers should be prepared to make at least 5 or 6 applications during the season. Occasionally, fewer applications are needed, but frequently several more are necessary.

The amount of insecticide used per acre should be increased gradually as the season progresses. As the cotton grows larger, more insecticide is needed to obtain adequate coverage. Furthermore, boll weevils are much harder to kill in August and September than in May and June. Migrating weevils sometimes move into fields late in the season in such large numbers that control is difficult, and frequent, heavy applications are necessary.

Many farmers make the serious error of stopping their control program too soon. Cotton insects often cause the greatest damage late in the season. It is during this time that large bolls which the plant cannot replace are destroyed. Late season applications for the protection of bolls may often be the most valuable applications of the entire program. Bolls must be protected from weevils until mature. Bolls must be protected from bollworms as long as worms are present or until the cotton opens.

APPLICATION OF INSECTICIDES

• **Sprays**—Sprays have proven very effective in the control of cotton insects and have several advantages over dusts. Sprays can be applied effectively in wind up to 20 miles per hour. This permits sprays to be applied all day long on most days. Insecticides applied as sprays are not as easily washed off the plants by rain or blown off by wind and other air movements. Sprays also seem to be more economical and effective than dusts for early-season control when the plants are small.

The necessity of mixing with water to obtain the desired amount of insecticide per acre is one of the disadvantages of sprays as compared to dusts. Furthermore, the spray nozzles may clog if the spray solution is not kept free of trash.

Do **not** apply sprays when plants are wet with rain or dew.

Insecticides to be used for spraying cotton should be bought as emulsifiable concentrates. The pounds of technical or active ingredient per gallon will be given on the label of the container. This enables the user to determine the amount of the emulsifiable concentrate to mix with water to obtain the recommended poundage of insecticide per acre. The amount of diluted spray to use per acre depends upon the ground speed of the machine, the number of nozzles per row, the type of nozzle used, the pressure developed by the pump, and several other factors. This information will have to be determined for each machine and operator.

• **Spraying Equipment** — Low-pressure, low-gallonage sprayers have been devised for use on cotton. These machines are usually tractor mounted but may be tractor or mule-drawn. Sprays should be applied at 40 to 80 pounds pressure depending upon the machine. Nozzles delivering a hollow, cone type spray should be used. Adjust nozzles so that they are from 6 to 10 inches from the plants. Nozzles should never be allowed to drag through the plants as this prevents good coverage. The number of nozzles to use per row depends upon the size of the plants as shown below:

Size of Cotton	No. of Nozzles to use per Row	Approx. amount of Spray delivered per acre
Seedling	1	2-3 gallons
Up to 20 in. high	2	4-6 gallons
Over 20 in. high	3	6-9 gallons

Spray machines should be equipped with a bypass or mechanical agitator so that the spray solution will be kept well mixed during the spraying operation. The tank should be partly filled with water and the pump or agitator started before the insecticide is added. It is advisable to mix the insecticide with a small amount of water before adding to the tank. Do not use wettable powders in low-gallonage, low pressure cotton sprayers.

Booms should be mounted on the rear of the tractor for the safety of the operator.

Airplanes can also be used to apply

sprays (see section on **Airplane Application**, below).

• **Dusts**—Dusts should be applied when the wind velocity is less than 5 miles per hour. The best hours for dusting are usually between 5 p.m. and 9 a.m. The presence of dew on the plants is not necessary.

• **Dusting Equipment**—Dusts can be effectively applied with hand operated, mule or tractor-drawn, or tractor-mounted dusting machines. Airplanes can also be used effectively. The ground machines should be adjusted to have one nozzle per row, 4 to 6 inches above the tops of the plants. Booms should be mounted on the rear of the tractor for the safety of the operator.

• **Airplane Application**—Both sprays and dusts can be effectively applied by airplanes. The distance between swaths should not be greater than the wingspan of the airplane (usually 30 to 40 feet). To insure proper swath width, flagmen should be used to indicate the correct interval to the pilot.

When applying early-season applications by airplane, the dosages of insecticides given in the chart should be increased by 50 percent. Use the high range of dosages when applying mid- and late-season applications from the air.

• **Good Coverage Is Important**—In order to control cotton insects, it is essential that the plants be well covered with insecticides. The drift of dust and spray must not be depended upon to give coverage. Dusts will not give good coverage of plants when the wind exceeds 4 or 5 miles per hour. Spray and dust nozzles should not be allowed to drag through the plants as this interferes with the proper distribution of the insecticides. One nozzle per row should be used when dusting and one to three nozzles per row should be used when spraying. Flagmen should be used to make sure that airplane swaths are not flown too far apart.

• **Proper Timing Is Essential**—Proper timing is probably the most important single factor in cotton insect control. Insect infestation counts must be made in order to determine when control measures are necessary. (See section on **How to Make Infestation Counts**). Applications of insecticides for boll weevil and bollworm control must be made at 4 or 5 day intervals for best results. The life cycle of the insects, the growth of the cotton plants, and the breakdown of the insecticides make this interval necessary.

When rain or other conditions make it impossible to get into the field with ground equipment, airplanes should be used. Applications that are washed off within 24 hours should be repeated within 48 hours.

PRECAUTIONS

1. All insecticides used for control of cotton insects are poisonous and should be handled with caution. Read carefully all labels on packages or containers before using any insecticide. Avoid body contact with and inhaling dust or fumes of these materials. **Liquid concentrate insecticides spilled on skin or clothing are extremely dangerous.** If this occurs, immediately remove clothing and bathe thoroughly with plenty of soap and water.

2. Avoid excessive drift of insecticides onto adjacent fields where animals are pastured or where food or feed crops are grown. Most insecticides are also toxic to poultry.

3. Beekeepers in the area should be notified before control programs are begun. Research has shown that toxaphene is less toxic to honey bees than the other insecticides commonly used for boll weevil and bollworm control. Sprays have been found safer than dusts if bees are not in the field when the spray is applied. Applying insecticides at night will reduce bee losses.

4. Insecticides will kill fish if allowed to drift onto or drain from cotton lands into ponds or streams.

5. Benzene hexachloride (BHC) should not be used on land where Irish potatoes and possibly other root crops will be grown during the next several years. There is a possibility of such crops picking up an off-flavor when grown on soil that has been contaminated with benezene hexacloride.

6. Special precautions should be taken in handling TEPP and parathion to avoid prolonged contact with the skin or breathing the vapors from either spray or dust.

7. Parathion and TEPP are highly toxic to human beings. These insecticides are poisonous if swallowed, inhaled, or absorbed through the skin. **The precautions printed on the package are for your protection and should be followed carefully.** When applying parathion or TEPP a respirator should be used to avoid inhaling the material. A special dust and vapor type respirator is necessary for protection.

If certain symptoms of illness appear, a doctor should be consulted at once. The antidote (atropine) known to be especially effective in the case of parathion and TEPP should be carried by those using the chemical, or should be available for immediate use if needed. See label on containers for symptoms and treatment.

1953 Cotton Insect Control Recommendations for:

Louisiana

The major cotton pests in Louisiana are the boll weevil, bollworm and cotton aphid (lice). Less important are the spider mites, cotton leafworm, thrips, cotton fleahopper, tarnished plant bug and rapid plant bug. There are several insecticides which will give adequate control of these pests. **The time at which control operations are begun, the interval between applications, the thoroughness of application and continuing applications as long as needed are more important for successful cotton insect control than the choice of any particular recommended insecticide.**

BOLL WEEVIL

The boll weevil is the number one pest of cotton in Louisiana. Consequently all cotton insect control operations should center around a sound boll weevil control program. This includes infestation counts made at least once a week, beginning when the plants start squaring and applying insecticides where and when needed.

Early Season Control

Poisoning for the control of overwintered boll weevils seldom, if ever, is profitable under Louisiana conditions and is not recommended as a general practice.

Where heavy populations of overwintered boll weevils do occur, which is usually near favorable hibernation quarters, such as wooded areas, waste lands and buildings, 2 or 3 applications of a recommended poison may be made. Treat only the area that is heavily infested.

The applications should be started as soon as the cotton starts squaring and made 7 to 10 days apart. Apply from ½ to ¾ the amount recommended for later applications (see tables for control recommendations).

Mid-Season Control

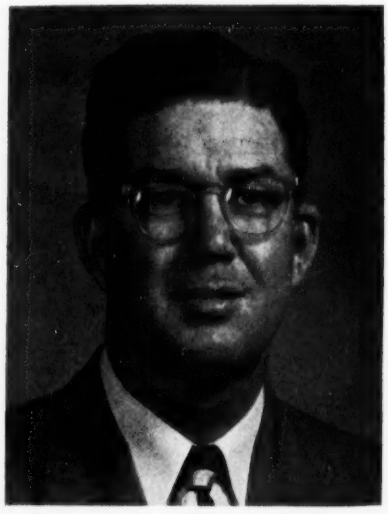
Begin treatment when 25 percent of the squares have been punctured by boll weevils and when the plants average at least 3 half-grown or larger squares per plant. Make applications at 4- or 5-day intervals. **Treat only those areas of the field where the infestation counts show control is needed.** (see tables for control recommendations).

Late-Season Control

After migration of boll weevils starts, usually about the middle of July in central Louisiana and about August 1 in north Louisiana, make insecticide applications 4 to 5 days apart until the crop is safe—when youngest bolls which are expected to be harvested are 3 weeks old. (see tables for control recommendations).

BOLLWORMS

The bollworms are second to the boll weevil in importance as cotton pests. Although they may be present on cotton anytime after fruiting begins, damaging infestations usually do not occur until about the middle of July. Infestations are likely to be more severe following applications of insecticides for control of other pests because of the destruction of beneficial insects which feed on the eggs and small bollworms. Applications should



N. M. RANDOLPH is the new Texas Extension Service entomologist whose appointment, effective Feb. 1, was announced in the Feb. 14 issue of The Cotton Gin and Oil Mill Press. He is a native Texan who has been a member of the Tarleton State College entomology department.

begin when eggs and 4 or 5 small bollworms per 100 plant tips are found. Counts should be made at weekly intervals to determine when control measures are needed. It is especially important to apply insecticides before the small bollworms have begun feeding on squares and small bolls. Thorough coverage of terminal growth is essential for successful control (see tables for control recommendations).

APHIDS

Damage by the cotton aphid often occurs following the use of insecticides for control of other pests. Aphids are usually found on the underside of the leaves and in the tips of the plants. Infestations are indicated by curling and twisting of the leaves and by the presence of honeydew on the upper surface of the leaves. Applications should begin as soon as honeydew is noticed on the plants (see tables for control recommendations).

SPIDER MITES

Spider mites often occur in destructive numbers on cotton. Like the cotton aphid they are found on the underside of the leaves. The tiny mites are so small that careful examination is necessary to detect their presence. Infestations usually develop around margins of fields, near ditch banks, roads and house sites. Damage by spider mites is usually associated with the application of insecticides for the control of other pests (see tables for control recommendations).

COTTON LEAFWORM

The cotton leafworm damages cotton by destroying the foliage before the crop is mature (see tables for control recommendations).

THRIPS

Nearly every field of cotton is infested in the seedling stage by thrips. These small elongated, yellow or dark-brown insects attack the seedling plants as soon as they are out of the ground. Their injury causes a ragging and crinkling of the leaves, retards growth, and may damage the stand. Cotton outgrows this injury, and there is usually little effect on yield. Thrips control may be justified because it allows the plants to grow off more rapidly and uniformly, which will be an aid in cultivation. Applications of insecticides for thrips control destroy many of the beneficial insects and often result in the build-up of damaging infestations of spider mites, bollworms and the cotton aphid (see tables for control recommendations).

COTTON FLEAHOPPER

The cotton fleahopper may cause injury to cotton by blasting small squares. Damage in localized areas may be sufficient to require control measures (see tables for control recommendations).

TARNISHED PLANT BUG AND RAPID PLANT BUG

The tarnished plant bug and rapid plant bug often cause injury to cotton by blasting the squares, including those nearly ready to open. The dust (except calcium arsenate) and spray mixtures recommended for boll weevil control will control these pests.

INSECTICIDE FORMULATIONS

Insecticides for cotton insect control are sold as dust and spray formulations. Dusts are mixed and bagged at the plant and are delivered ready to use. It is not advisable to attempt home-mixing of dusts. Sprays for cotton insect control are prepared as emulsifiable concentrates. Water must be added before they are ready to be applied. It is always advisable to test an emulsifiable concentrate before applying the spray to be sure it forms a good emulsion when the water is added.

INSECTICIDES RECOMMENDED FOR CONTROLLING COTTON INSECTS IN 1953

• **Calcium Arsenate** is an economical and effective insecticide for the control of the boll weevil and cotton leafworm. When it is used without an aphicide, an increase in the aphid population often results. This can be prevented by using 3-5-40 in alternate applications.

• **3-5-40 mixture** (3 percent gamma isomer of benzene hexachloride—5 percent DDT—40 percent sulphur) will control the boll weevil, cotton aphid, bollworms, cotton leafworm, cotton fleahopper, tarnished plant bug, rapid plant bug, thrips, fall armyworm, cutworms, grasshoppers, and suppress spider mites.

• **20-40 mixture** (20 percent toxaphene-40 percent sulphur) will control the boll weevil, bollworms, cotton leafworm, cotton fleahopper, tarnished plant bug, rapid plant bug, thrips, cutworms, fall armyworm, grasshoppers, and suppress spider mites.

• **Aldrin - DDT - Sulphur mixture** (2½ percent aldrin - 5 percent DDT - 40 percent sulphur) will control the boll weevil, bollworms, thrips, cotton fleahopper, tarnished plant bug, rapid plant bug, grasshoppers, and suppress spider mites. Aphid infestations often develop when this mixture is used.

• **Dieldrin-DDT-Sulphur mixture** (1½ percent aldrin - 5 percent DDT - 40 percent sulphur) will control the boll weevil, bollworms, thrips, cotton fleahopper, tarnished plant bug, rapid plant bug, grasshoppers, and suppress spider mites. Aphid infestations often develop when this mixture is used.

• **Heptachlor - DDT - Sulphur mixture** (2½ percent heptachlor-5 percent DDT-40 percent sulphur) will control the boll weevil, bollworms, thrips, cotton fleahopper, tarnished plant bug, rapid plant bug, grasshoppers, and suppress spider mites. Aphid infestations often develop when this mixture is used.

• **DDT** will control bollworms, cotton fleahopper, tarnished plant bug, rapid plant bug, cutworms, fall armyworm, and thrips. Its use alone may be followed by severe cotton aphid and spider mite infestations. In case of heavy infestation of bollworms, 10 percent DDT instead of 5 percent in the above mixtures containing DDT should be used.

• **Nicotine**, 3 percent in lime, can be used to knock out heavy aphid infestations.

• **Sulphur** should be included in all organic insecticide mixtures to prevent the build-up of spider mite infestations. Heavy applications will control established infestatations.

• **Parathion** is very effective for control of the cotton aphid and spider mites.

Parathion is an extremely dangerous poison. It is recommended for cotton only where trained personnel or other individuals are in position to assume full responsibility and to enforce proper precautions as prescribed by the manufacturer.

• **Aramite** at the rate of .6 to 1 pound of the technical material per acre, per application, has given satisfactory control of some species of spider mites. It can be applied either as a dust or spray.

SPRAYS

Sprays of the insecticides recommended herein, except calcium arsenate, are as effective as dusts when used in the same amounts and at the same intervals between applications.

The amount of the technical materials

(Continued on page 102)

Research on the

Preparation of Cottonseed Meats[1] For Filtration-Extraction

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THE National Cottonseed Products Association has supported actively research fellowships on cottonseed products in the United States Department of Agriculture for more than 25 years. Since 1951 two fellowships have been maintained at this Laboratory to aid in research (1, 5, 6, 10) to improve the nutritive value of cottonseed meal. Under one of the fellowships work is in progress on the development of a chemical test that might be used to indicate the nutritional value of experimental and commercial cottonseed meals. Work under the other fellowship has consisted of participation in a progam on the production of experimental meals by different methods of processing, whose quality will be evaluated in tests by nutritionists. The progress made in 1951 in investigating the processing conditions which would be suitable for the production of cottonseed meals of high nutritive value by fractionation, screw pressing, hydraulic pressing and solvent extraction has been reported (11). Conditions which received particular attention were those used in the rolling and cooking operations. Results indicated that the moisture content and temperature of the material during these operations had a pronounced effect not only upon the distribution of gossypol between the oil and meal products but also upon the chemical properties of the meal and the quality of oil.

This study on rolling and cooking was continued on a pilot-plant basis in 1952 to determine more comprehensively the effect of variations of time (30-60 minutes), moisture content (12-20 percent) and temperature (200-225 degree F.) in the cooking of cottonseed flakes upon the chemical properties of the meal and its nutritive value and the quality of the oil. Since the development of filtration-extraction process (4, 8, 18) required similar information, the cooked material was processed in the filtration-extraction pilot plant. Rolling and cooking are operations which filtration-extraction has in common with other processes, such as hydraulic pressing, screw pressing, prepressing solvent extraction. Hence it follows that pilot plant work on these operations, used in conjunction with filtration-extraction, can be related to efforts to improve these commercial processes, particularly in light of yielding meals of known processing history and chemical properties for use in various nutritional investigations.

This work was also valuable in determining whether variations in rolling and cooking had any critical effect upon the filtration-extraction process. The practicability (4, 8, 18) of this process depends upon the use of adequate rolling (17), cooking (2, 16, 21) and evaporative cooling of meats to yield a relatively crisp, granular material in which objectionable fines are consolidated into large agglomerates. This material must also have the desired characteristics for efficient filtration-extraction, such as rapid extractability of the oil, particles of optimum shape and size distribution, and relatively high in compressibility.

The fellow participated in conducting and evaluating the pilot plant rolling and cooking operations used in this work. Results are given of 5 pilot plant filtration-extraction runs and of a comparative hydraulic pressing run conducted to determine the effect of variations in time, temperature, and moisture content of the rolled meats during cooking on the interrelation between oil yield and oil quality. Chemical analyses of the corresponding meals are included. Although major emphasis was placed on preparation conditions (rolling and cooking) for obtaining oil extraction efficiency for the filtration-extraction process, it was possible to select conditions considered to be favorable to producing meals of improved nutritional value, as well as high quality oils.

Experimental

Material and Preparation. The same lot of prime cottonseed was used in all 6 runs. It was obtained from ginning of cotton grown in the Delta region of Mississippi during the 1951 season. It was delintered at the Greenwood mill of the Mississippi Cottonseed Products Co. and shipped to the Laboratory late in December 1951. The analysis of the seed was as follows: First moisture, 10.42 percent; second moisture (after fuming), 1.84 percent; nitrogen, 3.97 percent; oil, 21.16 percent. The analysis of kernels (hull-free) was as follows: Free gossypol, 0.93 percent; total gossypol, 1.01 percent; moisture content, 7.67 percent; and f.f.a., 0.81 percent. All 6 runs were conducted within 5 months after receipt of the cottonseed.

For each run approximately 1200 lbs. of delintered cottonseed were hulled with a bar huller. The whole and fine meats were combined and adjusted with hulls so that the resultant mixture had a nitrogen content of approximately 5.1-5.4 percent. The freshly prepared meats for each run had a moisture content of approximately 8.5-9.0 percent and were flaked (rolled) without any additional moisture treatment.

Rolling Operation. The meats for all 6 runs were rolled under identical conditions using a pilot plant set of conventional 5-high rolls as previously described (16). The roll setting (no load-idle) was 0.024 inch between first and second, 0.016 inch between second and third; 0.008 inch between third and fourth; and 0.003 inch between fourth and fifth. The feed rate to the rolls was approximately 400 lbs. per hour. The rolled meats were 0.006-0.008 inch in thickness.

Cooking. The cooking operation for each run was conducted in the pilot plant unit shown in Figure 1. This vertical type French cooker, consisting of 5 rings, each 22 inches in diameter and 18 inches high, has been described by Reuther, et al. (16). Runs Nos. 1, 2, 4, 5 and 6 represented different cooking conditions used in preparing material for filtration-extraction. Run No. 3 was intended to show a comparison between hydraulic pressing and filtration-extraction of cooked cottonseed meats. Controlled amounts of water, atomized with steam, regulated to a specific pressure and temperature were introduced into the first ring while the rolled meats were fed continuously into the ring. This controlled operation raised quickly the temperature and moisture content of the rolled meats in the first ring to the desired conditions of moisture and temperature during cooking operation for each run.

The rolled meats were cooked in a total of 12 successive batches, each weighing about 60 pounds. In Runs Nos. 1 through 4, where all 5 rings were used, every 14 minutes a batch of cooked material was discharged from the 5th ring using the last 2 minutes of the residence period (14 minutes) in the ring for this operation. Following this, in successive 2-minute intervals each, the material in ring 4 was discharged manually into 5, 3 into 4, 2 into 3, and 1 into 2. Thus it follows that every 14 minutes a batch of rolled meats was fed into the first ring (uniformly over the first 6 minutes of the 14 minute residence period), and that each batch remained in the cooker for a total of 68 minutes. In run 5, only the first three rings of the cooker were used but the residence time in each ring was also 14 minutes, thus resulting in a total cooking time of 40 minutes. In Run No. 6 also, the first three rings of the cooker were used, and the residence time in a ring was reduced to 12 minutes. This resulted in a total cooking time of 34 minutes.

The temperature and moisture contents of the meats at the successive stages of cooking in each run were as follows:

In **Run No. 1**, the average temperatures in the 5 rings of the cooker were 202, 211, 214, 217 and 224° F., respectively. The corresponding moisture contents were 17.5, 17.6, 17.5, 13.2 and 11.8 percent.

In **Run No. 2**, the average temperatures were 200, 213, 218, 220 and 225° F. in the 5 rings; and the moisture contents were 18.2, 17.1, 13.4, 8.9 and 9.0 percent.

In **Run No. 3**, the average temperatures were 200, 211, 217, 220, and 225° F. in the 5 rings; and the moisture contents were 15.2, 15.0, 10.7, 9.1 and 8.6 percent.

In **Run No. 4**, the average temperatures were 195, 190, 193, 194, and 200° F. in the 5 rings; and the moisture contents were 13.6, 12.7, 12.1, 10.1 and 10.0 percent.

In **Run No. 5**, the average temperatures were 210, 200, and 200° F. in the

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[2] Resigned as Fellow N.C.P.A. October, 1952.

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Table 1. Effect of Various Cooking Conditions on the Quality of Cottonseed Oil and Meal Products

Cooking Conditions		Chemical Properties of Meats and Meal								Evaluation of Crude Oils			
					Nitrogen		Gossypol				Storage—100° F.		
Run No.	Material	First [1] H_2O	Second [2] H_2O	Oil	Total	Sol. [3]	Free [4]	Total [5]	Thiamine [6]		Initial	14 days	28 days
		%	%	%	%	%	%	%	p.p.m.				
1—Filtration-Extraction													
Cooking	Meats	8.6	8.4	—	5.22	—	0.95			F.F.A., %	.93	1.03	1.1
Temp., °F.—200-225	Flakes	8.3	7.8	30.3	5.18	73	0.85	.97	20.0	Gossypol, %	.0082	.007	.007
Time, min.—68	Ring No. 1	17.5	8.3	—	—	52	0.075	—	—	Refining [7]—Loss %	4.81	4.87	5.04
No. of rings—5	Ring No. 5	11.8	5.5	—	5.29	33	0.019	—	—	Color—Lovibond			
	To Extr.	9.6	5.9	30.2	5.25	35	0.023	—	13.8	Refined—35 Y	7.36 R	7.36 R	10.1 R
	Final Meal	6.0	6.0	0.83	7.92	34	0.027	1.32	17.0	Bleach—20 Y	1.58 R	2.27 R	2.74 R
2—Filtration-Extraction	Meats	8.7	8.7	—	5.2	—	0.87	—	—	F.F.A., %	1.08	1.00	1.07
Cooking	Flakes	8.3	8.3	30.4	5.4	75	0.74	.96	20.0	Gossypol, %	.009	.008	.005
Temp., °F.—200-225	Ring No. 1	18.2	13.1	—	—	54	0.044	—	—	Refining [7]—Loss %	4.17	5.07	4.65
Time, min.—68	Ring No. 5	9.0	7.2	—	—	49	0.026	—	—	Color—Lovibond			
No. of rings—5	To Extr.	8.1	7.6	29.7	5.3	47	0.026	—	12.2	Refined—35 Y	5.32 R	5.32 R	7.36 R
	Final Meal	5.3	4.9	1.02	8.1	45	0.028	1.28	17.5	Bleach—20 Y	1.66 R	1.66 R	2.27 R
3—Hydraulic Pressing	Meats	8.4	8.1	—	5.4	—	0.85	—	—	F.F.A., %	1.03	1.00	1.1
Cooking	Flakes	8.2	8.3	30.6	5.4	75	0.73	.99	20.4	Gossypol, %	.019	—	0.017
Temp., °F.—200-225	Ring No. 1	15.2	5.2	—	—	54	0.073	—	—	Refining [7]—Loss %	3.20	3.54	4.15
Time, min.—68	Ring No. 5	8.6	5.5	—	—	46	0.023	—	13.4	Color—Lovibond			
No. of rings—5	Final Meal	9.5	9.5	5.3	7.3	47	0.044	.91	16.8	Refined—35 Y	5.22 R	5.79 R	7.36 R
										Bleach—20 Y	1.19 R	1.66 R	2.27 R
4—Filtration-Extraction	Meats	8.8	7.8	—	5.3	—	0.91	—	—	F.F.A., %	.94	1.36	1.67
Cooking	Flakes	8.5	7.7	30.8	5.3	74	0.71	0.97	20.9	Gossypol, %	0.020	0.014	0.014
Temp., °F.—200	Ring No. 1	13.6	11.4	—	—	57	0.128	—	—	Refining [7]—Loss %	4.94	5.53	6.20
Time, min.—68	Ring No. 5	10.0	8.6	—	—	52	0.058	—	—	Color—Lovibond			
No. of rings—5	To Extr.	7.6	7.7	30.5	—	53	0.063	—	17.4	Refined—35 Y	5.32 R	5.84 R	6.55 R
	Final Meal	5.0	4.1	0.53	8.2	48	0.063	1.37	24.4	Bleach—20 Y	1.36 R	1.66 R	1.66 R
5—Filtration-Extraction	Meats	9.2	8.9	—	5.4	—	0.88	—	—	F.F.A., %	1.65	1.78	1.77
Cooking	Flakes	8.5	8.2	30.5	5.2	75	0.70	0.86	20.6	Gossypol, %	0.017	0.018	0.018
Temp., °F.—200-210	Ring No. 1	16.1	12.0	—	—	57	0.074	—	—	Refining [7]—Loss %	6.39	6.36	6.15
Time, min.—40	Ring No. 3	12.6	9.2	—	—	54	0.036	—	—	Color—Lovibond			
No. of rings—3	To Extr.	10.4	8.8	29.4	—	55	0.040	—	16.6	Refined—35 Y	5.32 R	7.36 R	7.90 R
	Final Meal	9.5	9.5	1.1	7.8	52	0.059	1.18	22.7	Bleach—20 Y	1.66 R	2.27 R	2.74 R
6—Filtration-Extraction	Meats	8.6	8.6	—	5.1	—	0.83	—	—	F.F.A., %	1.22	1.33	1.29
Cooking	Flakes	7.8	7.8	30.4	5.13	74	0.74	0.94	19.9	Gossypol, %	0.025	0.025	0.021
Temp., °F.—210	Ring No. 1	12.0	6.6	—	—	55	0.13	—	—	Refining [7]—Loss %	4.14	3.98	4.11
Time, min.—34	Ring No. 3	10.5	9.0	—	—	52	0.044	—	—	Color—Lovibond			
No. of rings—3	To Extr.	8.9	—	28.3	—	—	0.048	—	16.4	Refined—35 Y	6.55 R	7.36 R	8.33 R
	Final Meal	5.4	5.4	1.07	7.95	49	0.070	1.37	22.6	Bleach—20 Y	1.66 R	2.74 R	2.74 R

[1] Moisture content of material at indicated stage of processing.
[2] Moisture content—"as is" basis for oil, nitrogen, thiamine, free and total gossypol as reported above.
[3] Percentage soluble in .5 N NaCl solution.
[4] Determined by method of Pons and Guthrie (12).
[5] Determined by method of Pons, Hoffpauir, and O'Connor for total gossypol in meal (13) and oil (14).
[6] Determined by the modified method developed by the Analytical Division of SERL from two published methods. (3) (22)
[7] Official A.O.C.S. method for hydraulic pressed oils (Ca-9a-41). In all cases firm foots were produced.

3 rings; and the moisture contents were 16.1, 13.7, and 12.6 percent.

In **Run No. 6**, the average temperatures were 210, 210, and 215° F. in the 3 rings; and the moisture contents were 12.0, 13.5, and 10.5 percent.

Cooling. The cooked, rolled meats produced in Runs Nos. 1 and 4 were cooled on trays to 140° F. and then re-formed through flaking rolls (clearance between rolls 0.010 inch) before being fed to the slurry mixer in the filtration-extraction pilot plant. The cooked, rolled meats from Runs Nos. 2, 5, and 6 were passed through a ¼-inch mesh screen to break up "moisture balls," and the screened material was cooled to 140° F. before being fed to the slurry mixer.

Hydraulic Pressing. The cooked meats prepared in Run No. 3 were hydraulic pressed in the pilot plant experimental press. The description of this press and the operational hydraulic pressing procedure used in this run is also described in the publication by Reuther, et al. (16).

Filtration - Extraction. The cooled, cooked, rolled meats in Runs Nos. 1, 2, 4, 5 and 6 (see Table 1) were extracted with commercial hexane using the pilot plant filtration-extraction equipment and procedure described by Gastrock, et al. (8) and D'Aquin, et al. (4).

This pilot plant was operated at the rate of 5 lbs. per minute of fed material to the slurry mixer. The solvent to meats ratio was 1 to 1 by weight. The miscella was clarified easily by means of a small pressure leaf-type filter. The marc discharged from the rotary horizontal type filter contained approximately 30 percent solvent by weight.

Oil and Meal Recovery. A description and operation of both the oil and the meal recovery pilot plants used to remove the commercial hexane from the miscellas and marcs, respectively, has been published by Gastrock and D'Aquin (7).

Oil. The commercial hexane was removed from the oil in the miscella by continuous evaporation and stripping operations carried out identically as far as possible for each of the runs in the oil recovery pilot plant. The maximum temperature reached in concentration of the miscella to 85-90 percent oil by evaporation was 180° F., and in removing the remainder of solvent by stripping was 200-210° F. Both operations were conducted using a reduced pressure of approximately 20" of mercury. These conditions were selected to avoid any appreciable fixation of color (19) in the crude oils. The moisture and volatile contents in the final crude oils were approximately 0.3 percent by weight.

Meal. The marcs (meal-solvent mixture) discharged from the rotary horizontal filter were desolventized in the meal recovery pilot plant (9). This continuous operation was conducted using an indirect steam pressure of 35 lb. per sq. inch and required approximately 40 minutes.

The maximum temperature of vapor was 210° F. (from bottest dryer) and the temperature of the final meal (discharged from the dryer) was approximately 180° F.

Chemical Analyses of Meals. First moisture (moisture content of the material of various stages of processing), second moisture ("as is" basis for chemical analyses), oil content, total nitrogen, soluble nitrogen (in 0.5 N sodium chloride), free gossypol (12), total gossypol (13) and thiamine (3, 22) were deter-

mined on the meats, rolled meats, cooked meats and final meals.

Determination of Oil Quality. Data on the quality of the crude oils, produced in each run, was obtained within 48 hours after processing, after 14 days of storage of the oil and after 28 days of storage at 100°F. On these oils, the gossypol-like pigments, free fatty acid, refining loss, refined color and bleached color were determined using official A.O.C.S. methods.

It is known to the industry and from other research investigations (20) at the Southern Regional Research Laboratory that some screw-pressed oils and even some solvent-extracted oils which initially meet trade requirements for prime color upon storage or in transit revert drastically in color and prime color cannot be obtained when officially analyzed. It is also generally known in the industry that crude oils from hydraulic pressing usually exhibit little reversion in color upon storage. The storage temperature of 100°F. was selected in these experiments since this would be the maximum temperature to which commercial oils would normally be subjected.

Results

Table I gives data showing the effect of the cooking conditions in the 6 runs on oil and meal quality. The data also show that filtration-extraction yielded final meals containing 1 percent or less residual oil (on an equivalent protein content of 41 percent in the meal) for all the variations in cooking investigated. It should be emphasized that the conditions used for the cooking period in Ring 1 (all runs) brought about practically all the reduction in free gossypol in the meats, and only little reduction further took place as each of the following successive stages of processing used to obtain the final meals. The reduction was the greatest (to 0.044 percent) at the highest moisture content (18.2 percent, Run No. 2), the least (0.13 percent) at the lowest moisture content (12 percent, Run No. 6). An increase in cooking temperature, cooking time, and in initial moisture content (Run No. 2), as compared to a decrease in these conditions, (Runs No. 5 and No. 6), resulted in a lower free gossypol content in the final meal. The soluble nitrogen content of the final meals was practically the same for Runs Nos. 2 to 6, and in general the thiamine content of these meals increased somewhat as the cooking temperature and moisture were decreased. On the basis of the chemical analyses, as a whole, the meals from filtration-extraction appear to be of somewhat improved quality as compared to present commercial hydraulic-pressed and screw-pressed meals (15). One property of the filtration-extraction meals, which may offset any beneficial effect in improved meal quality, is that the total gossypol content of these meals was rather high, showing that the cooking conditions used bound practically all the gossypol within the meal, and that little was destroyed or introduced into the final oil. Such an operation may prove to appreciably lower the availability of some of the essential dietary constituents in the cottonseed meal.

The results in Table I show that not only the initial oils but the oils subjected to 14 days and 28 days storage at 100°F. essentially met requirements for prime grade. The results further show that the quality of the oils from filtration-extraction runs was comparable to that for the oils from the hydraulic pressing run. Incidentally, some of the cooked, rolled meats from runs 2 and 4 were hydraulically pressed, under identical conditions as used for this operation in Run 3, and the results of the analyses (refining loss, refined color, bleach color) of the corresponding oils, initially and under the same storage conditions, were essentially the same as those for the similar oils from Run 3. It should be noted from Table 1 that the gossypol-like content of the oils was extremely low and that it did not appreciably change under storage conditions.

Conclusion

The results indicate that the cooking operations used in this investigation aids the filtration-extraction process in yielding a meal with less than 1 percent residual oil, of low free gossypol content, and of relatively high soluble nitrogen and thiamine content, and a corresponding oil of prime grade, even when subjected to a high storage temperature for several weeks. The oil is also comparable in quality to that obtained by hydraulic pressing of cottonseed prepared identically as for filtration-extraction. This is true even when the conditions in the modified cooking operation are varied in time from 34 to 68 minutes, in temperature from 200-225°F., and in initial moisture content of the material in the first ring of the cooker from 12 to 18 percent.

There is some evidence that increasing the moisture content in the initial stage of cooking (first ring) to 18 percent results in free gossypol of 0.02 to 0.03 percent in the final meal when using a flaking preparation as outlined in this investigation.

Under cooking conditions used, practically all the gossypol in the meats is bound, resulting in very little (0.02 percent or less) in the oil. This may explain partly why the oil reverted little in color during the storage tests.

These results show that there is enough flexibility in the cooking operation to obtain optimum oil yield by filtration-extraction and yet the range of conditions in this operation is such to permit beneficial variations that may result in improved oil and meal products.

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or	Alternated with calcium arsenate	7-10		Same
Boll weevil,	B. BHC-DDT-sulphur, 3-5-40	10-15		Same
bollworms and	C. Toxaphene-sulphur, 20-40	10-15		Same
spider mites	D. Aldrin-DDT-sulphur, 2½-5-40	10-15		Same
	E. Dieldrin-DDT-sulphur, 1½-5-40	10-15		Same
	F. Heptachlor-DDT-sulphur, 2½-5-40	10-15		Same
Bollworms	A. DDT, 10%	10-15	When eggs and 4 or 5 small bollworms per 100 plant tips are found present	5 days
Cotton leafworm	A. Calcium arsenate	10	When leafworms appear	When needed
	B. Toxaphene-sulphur, 20-40	10	Same	Same
	C. BHC-DDT-sulphur, 3-5-40	10	Same	Same
Cotton fleahopper	Same as for boll weevil	7-10	When 25 fleahoppers per 100 plant tips are found	7-10 days
Spider mites	A. Sulphur	20-25	When mites appear	4 or 5 days
	B. Parathion, 1%	15	Same	Same
Cotton aphid	A. BHC-DDT-sulphur, 3-5-40	10-15	When honeydew appears	When needed for "knockout"
	B. Parathion, 1%	10-15		
	C. Nicotine, 3%	10-15		
Thrips	Aldrin, dieldrin, heptachlor, toxaphene, BHC or any of the mixtures recommended for boll weevil control	5-6	As soon as cotton is up to a stand	7-10 days

SPRAYS

Insect	Insecticide	Pounds of Technical Insecticide Per Acre
Boll weevil	Toxaphene	2-3
or	Aldrin-DDT	.25 aldrin + .5 DDT
Boll weevil	Dieldrin-DDT	.15 dieldrin + .5 DDT
and bollworms	Heptachlor-DDT	.25 heptachlor + .5 DDT
	BHC (gamma isomer)-DDT	.3 g BHC + .5 DDT*
Bollworms	Toxaphene-DDT	2 Toxaphene + .5 DDT
	DDT	1
Cotton leafworm	Toxaphene	2
	BHC-DDT	.3 g BHC + .5 DDT
Cotton fleahopper	Same as for boll weevil	½ to ¾ of that required for boll weevil control
Thrips	Aldrin, dieldrin, heptachlor, toxaphene, BHC or any of the mixtures recommended for boll weevil control	Half the amount recommended for boll weevil control
Spider mites	Parathion	.1 to .2
	Aramite	.6 to 1
Cotton aphid	Parathion	.1 to .2
	BHC (gamma isomer)-DDT	.3 g BHC + .5 DDT

*Some formulations of .3 lbs. of g BHC + .5 lbs. DDT have caused plant injury.

State Guides

(Continued from page 97)

contained in different emulsifiable concentrates may vary between materials and also formulations of the same material. In using a spray concentrate, the actual number of pounds of the insecticide there is per gallon must be known in order to determine the amount of the concentrate to use per acre. The number of pounds of the technical material contained per gallon is given on the label of most of the spray concentrates offered for sale for cotton insect control. The quantity of finished spray applied per acre will vary with the type and speed of the equipment.

GENERAL PRECAUTIONS

The insecticides recommended for cotton insect control are poisonous to man and animal. The following suggestions should be followed when handling these materials:

1. Buy only properly labeled insecticides.
2. Study and follow precautions given on the label.
3. Do not open containers in closed rooms.
4. Avoid breathing the fumes of insecticides.
5. Wear a recommended respirator when handling or applying insecticides.
6. Wear plastic-coated gloves when handling spray concentrates and wash hands frequently with soap and water.
7. If liquid concentrates are spilled on skin or clothing, remove clothing and bathe with soap and water immediately.
8. Take bath, using soap freely, and change clothing following exposure to insecticides.
9. Store insecticides where they are inaccessible to children and animals.
10. Avoid contamination of ponds and streams.
11. Avoid drift of insecticides onto pastures, feed or food crops.
12. Destroy empty containers by burning them in the open or burying them.

APPLICATION OF INSECTICIDES

• **Application of dusts**—All cotton dusts may be applied during either the early morning, late afternoon or night **when the air is calm.** For effective control, it is necessary that the dust stay down among the plants and not rise and float away. For this reason, late afternoon and night applications are preferable to early morning applications. **Complete coverage is necessary.**

Any type of cotton duster, either ground machine or airplane, may be used to apply dusts. The swath should never be wider than that which is recommended for the particular machine. Never depend on drift for coverage. In the case of airplane applications, the swath should never be wider than the wingspread of the airplane. Marking of swaths by flagging is essential.

• **Application of sprays**—Sprays may be applied by ground machine or airplane. The swath should never be wider than that which is recommended for the particular machine. Never depend on drift for coverage. In the case of airplane applications, the swath should never be wider than the wingspread of the airplane. Marking of swaths by flagging is essential.

When spraying with tractor equipment, use 1 nozzle per row on small cotton, 2 nozzles per row on cotton approximately 20 inches high and 3 nozzles per row on cotton 2 feet or higher.

1953 Cotton Insect Control Recommendations for:

Mississippi

Proper timing, sufficent number of applications and thorough coverage with insecticides are essential for effective insect control.

It takes a combination of good farming practices and insect control to give the desired yields and quality of cotton.

Land selection, fertilization, cultural practices, defolation and stalk destruction are important factors in cotton production and contribute toward insect control.

Learn to recognize injurious and bene-

ficial insects in the cotton field. Take insects to your county agent for identification or send to your Extension Entomologist, State College, Mississippi. Also **learn how to determine** if insects are damaging your cotton and **when to poison.**

DO NOT DUST OR SPRAY AS A PURELY PREVENTIVE MEASURE JUST BECAUSE YOUR NEIGHBOR DUSTS OR SPRAYS.

SAFETY MEASURES

All of the insecticides recommended for cotton insect control are **poisonous** and some are very toxic to man.

Do not open insecticide containers in closed rooms. Use respirator, avoid breathing fumes from diluted materials as well as concentrates.

Carry soap and water to field and wash hands thoroughly after mixing concentrates. Better still, wear rubber gloves and use respirator.

POISON SCHEDULE

(When to Poison)

Suggestions are given in this schedule that will help the cotton farmer determine a need for applications of poison to a cotton field.

Seedling Cotton (Two Leaf Stage)

Thrips and Cutworm Control—Control these pests to **speed growth** and **protect stand.**

Thrips: Spray or dust when first pair of leaves spread (before chopping). Make a second application 7 to 10 days later. Thrips control is an insurance toward a healthy, fast growing seedling, that is more resistant to diseases.

Curled, wrinkled leaves in the bud, ragged cotton, indicates that thrips have damaged the young cotton.

To find them in the field pull a plant or two and shake over a piece of white or brown paper or a handkerchief. Thrips are about 1/60 of an inch in length.

Cutworms: Look for seedling plants cut off or pulled into the ground. Worms are generally found hidden under clods of dirt along the drill. Poison and re-examine in 3 or 4 days for control obtained.

Early Season

(When cotton begins to put on squares —7 to 8 leaf stage). Examine the cotton plants one to two times each week for damage of the following insects:

Boll Weevils: (coming from hibernation)—Weevils coming out of hibernation in large numbers damage the young cotton plant (usually before fruiting starts) by feeding in the buds of the plants. This may require **spot poisoning** in large fields in the delta and entire fields in the hill area of the state.

To make a boll weevil count in this young cotton look for boll weevils in the bud along **25 feet of row** in **five places** in the field. **Each weevil found in the 125 feet of row examined, multiplied by 100,** indicates the number of weevils **per acre. If 100 or more weevils are found per acre, poison once a week** until **squares** are 8 to 10 days old **then** make **square** infestation count.

Boll Weevils—(Puncturing Squares)—When squares are 8 to 10 days old (size of a pencil rubber) **begin making square infestation counts** at least once a week.

Infestation counts can be made two ways: **One** is to examine 20 squares for punctures near each of the four corners of the field and 20 squares in the center of the field, making a total of 100 squares. **The other method** is to criss-cross the field from two directions and examine 100 squares. **In both methods** the punctured square should be pulled off and held in the hand until 100 squares have been examined. **A punctured square** is indicated by a small opening caused by the feeding of the boll weevil or by a small wart on the side of the square where the boll weevil has deposited an egg. The number of punctured squares held in the hand will be the **percent of infestation.** A count should be made for each 10 to 15 acres.

When **15% to 25% of the squares examined are punctured, poison** at least 3 or more times at 4 to 5-day intervals. Then make additional infestation counts and apply poison as needed.

Bollworms: Check the **infestation** of bollworms in the same field patterns as given for the boll weevil above. **Examine 100 terminal buds.** When 10 to 15 eggs and 3 or 4 small worms are found per 100 terminal buds examined, **poisoning should start.** Poison every 5 days until brought under control. Pearly white eggs are usually found on small leaves near the bud, and blackish discolored feeding frass or droppings in the webbed bud, indicate that the tiny worms are present or are in the small squares close by. Look in the rank or fast growing cotton **first.**

Mid-Season (Blooming)

The cotton fields should be examined at least twice a week. Make infestation counts for boll weevil, bollworm, spider mite, aphids or other pests.

Boll Weevil: Make infestation counts as shown under Early Season. **Poison at** least 3 times, **4 to 5 days apart.** Make additional infestation counts.

Bollworms: Make infestation counts as shown under Early Season. **Poison** when needed.

Spider Mites: These pests are usually associated with hot, dry weather. Examine the underside of leaves for small red, green or yellow spider mites. They are usually found in damaging numbers near weed patches, ditch banks, or along dusty roads. They spread very rapidly over the entire field. Blood red or yellow spots on the upperside of the leaves usually indicate that they are damaging the cotton plant, but fertilizer deficiencies may also cause red leaves.

Poison when spider mites are found generally in the field and damage signs begin to appear. One application of a systemic poison or 2 applications of other miticides, 4 to 5 days apart, will usually give a "knock out" of this pest.

Cotton Fleahoppers, Tarnished and Rapid Plant Bugs usually feed on the small squares, causing them to turn brown and fall off. Application of poisons for other insects usually control these pests.

Aphids: Honeydew and wrinkled leaves are indications of aphids sucking in the bud or underside of the leaves. Poison when aphids, and honeydew (small glossy spots on upperside of leaves in dry weather) begin to appear in the field.

Continue to watch fields for reinfestation or build-up of these pests.

Late Season

Migrating boll weevils damage more late season cotton than any other insects, but bollworms can do considerable damage.

If heavy migration occurs increase pounds of dust 1/3 and increase the spray concentrates by using 1/3 less water.

Make infestation counts twice a week. Protect bolls until they are 4 weeks old.

After September 15 do not try to protect squares. **Poison** only to protect young bolls until they are at least 4 weeks old. Do not wait **over** 4 days between poisonings.

COTTON INSECTICIDES—MITICIDES—1953

Listed below are the poisons that are recommended for cotton insect control for 1953. (Listed in alphabetical order, not in order of preference.)

• **Aldrin — Dusts:** (2½-0-0) (2½-5-0) (2½-10-0) or 40% sulphur added. **Sprays:** (2 lbs. emulsifiable concentrate) used alone, with DDT, or with other materials. Aldrin at recommended amounts will control boll weevils, thrips, cotton fleahoppers and rapid and tarnished plant bugs. Aldrin will not control aphids, but if DDT is not included in the early applications, aphids will not be a problem. Aldrin with DDT can be used when bollworms begin to appear.

• **Aramite—Dust:** (3%) **Spray:** (2 lbs. emulsifiable concentrate). Aramite at recommended amount will control spider mite. It can be used alone or in combination with other materials.

• **Gamma BHC—Dusts:** (3-0-0) (3-5-0) (3-10-0) or 40% sulphur added. **Sprays:** (1.2 lbs. emulsifiable concentrate) used alone, with DDT, or with other materials. Gamma Benzene Hexachloride at recommended amounts will control the boll weevil, cotton aphids, tarnished and rapid plant bugs, cotton leafworm, thrips, cotton fleahoppers, and grasshoppers. DDT must be added for bollworm control. When 40% sulphur is added to the dust, it usually supresses spider mite, however, sometimes sulphur fails to give control of spider mite.

• **Calcium Arsenate**—This is a good poison for boll weevils and leafworm control in mid- or late-season. It can be alternated with a BHC-DDT cotton dust. It is very dangerous to livestock.

• **DDT—Dust:** (5%) (10%). **Sprays:** (2 lbs. emulsifiable concentrate). DDT can be used alone or in combinations with other materials. DDT will control bollworms, thrips and cotton fleahoppers. It may create an aphids problem when used alone.

• **Dieldrin — Dusts:** (1½-0-0) (1½-5-0) (1½-10-0) or 40% sulphur added. **Sprays:**

Quotes From Our Authors:

"RESEARCH is not magic. Research means hard work over many years in exploring all possible lines of attack (on the pink bollworm). This accelerated research program will not yield a panacea, but existing weapons will be improved and new ones developed to combat this dangerous enemy and check its eastward spread."—K. P. EWING.

(1½ lbs. emulsifiable concentrate) used alone, with DDT, and other materials. Dieldrin at recommended amount will control boll weevils, cutworms, thrips, cotton fleahoppers, tarnished and rapid plant bugs, and grasshoppers. Cotton aphids do not usually build up following its use unless DDT is included in the mixture.

• **Heptachlor—Dusts:** (2½-0-0) (2½-5-0) (2½-10-0) or 40% sulphur added. **Sprays:** (2 lbs. emulsifiable concentrates) used alone, with DDT, and other materials. Heptachlor at recommended amounts will control boll weevils, cotton fleahoppers, grasshoppers, thrips, tarnished and rapid plant bugs and cutworms. It will not control aphids but if DDT is not included in the early applications, aphids should not be a problem.

• **Parathion — Dust:** (1%). **Spray:** (2 lbs. emulsifiable concentrate). **This is a very dangerous material and should be handled with care.** It is recommended for aphids and spider mite control. It can be combined with other materials, where other insects are a problem also.

• **Sulphur**—Used alone or combined with other materials, to control the spider mites. Hot weather favors the effectiveness of this material against spider mites. However, sometimes sulphur does not give good control of these pests.

• **TEPP**—(Tetraethyl Pyrophosphate)—**Spray:** (4 lbs.) This material will control aphids and spider mites. To be effective, it must be applied immediately after mixing.

• **Toxaphene — Dusts:** (20-0) (20-40) DDT, and other materials added. **Sprays:** (6 lbs. - 8 lbs. emulsifiable concentrates) used alone, with DDT and other materials. Toxaphene, at recommended amounts, will control boll weevils, cutworms, thrips, cotton fleahoppers, rapid and tarnished plant bugs and yellow striped armyworms. Toxaphene will hold down light infestations of bollworms but DDT must be added to get control of heavy infestations of large worms.

NOTE: The **POUNDS** under **sprays** is the amount of insecticide in **one** gallon of emulsifiable concentrate.

Promising New Insecticides — Miticides

Endrin (Compound 269), **Methyl Parathion, EPN,** and **Systox** have shown considerable promise for the control of several cotton pests in field experiments during 1952. Although additional research is needed, sufficient data has been obtained to warrant their use in large scale field trials during 1953. They are recommended for use on cotton only where persons applying them are fully aware of the hazards involved and will follow the precautions prescribed by the manufacturers.

• **Endrin** (Compound 269)—**Spray:** (1.6 lbs. emulsifiable concentrate). As a spray, it has controlled bollworms, cotton leafworms, thrips, cotton fleahoppers, lygus bug, and boll weevil. It did not control spider mites or aphids. It should be handled with extreme caution.

• **EPN** (4 lbs. emulsifiable concentrate) —EPN is recommended for yellow striped armyworm. However, it has been found that it will control boll weevil, thrips, cotton fleahopper, and cotton leaf worm. Aphids and bollworms may build up to damaging numbers after its use, but spider mites do not. It should be handled with extreme caution.

• **Methyl Parathion** (2 lbs. emulsifiable concentrate)—It is effective against the spider mite, aphids, leafworms, and appears promising against boll weevils. It will not control bollworms. It is not quite as dangerous as parathion.

• **Systox — Spray:** (2 lbs. emulsifiable concentrate). It will give control of spider mites and aphids. As a systemic poison, it is absorbed into the plant through the leaves and goes to all parts of the plant. This is a new material and is extremely dangerous and should be handled with precautions.

BENEFICIAL INSECTS

Lady Beetle, Flower Bug, Lace Winged Fly, Spiders, Sweat Fly and wasps are among the beneficial insects in the cotton field that help in the control of aphids, bollworms, spider mites, thrips, cutworms, leafworms and others by eating either the eggs, young or adults.

Farmers should learn to recognize these beneficial insects in their cotton field.

APPLICATION OF DUSTS

All dusts should be applied **when the air is calm.** This is usually the late afternoon and first part of the night. The dust must stay down among the plants and not rise and drift away. Spouts must be directly above the plants, preferably 6" to 10". **COMPLETE Coverage Is Necessary.**

Any type cotton duster can be used. **Avoid Y'S on Hand Dusters.** Never depend on drift for coverage. In airplane dusting the planes should generally not cover swaths wider than the plane wings. Flagging is essential.

If it rains and the insecticide is washed off within 10 hours after application, repeat immediately. If in 10 to 24 hours, repeat the third day.

Rates of Dust Per Acre

For thrips, cutworms or aphids (plant lice), use 5 to 8 pounds per acre, 7 to 10 days apart.

For early season (first squaring) control of overwintering weevils in buds of young cotton, bollworms, or tarnished and rapid plant bugs, or fleahoppers, use 5-8 pounds per acre, making 3 or 4 applications 5 to 7 days apart.

For mid-season use at least 10 pounds

Dilution Table for Cotton Spray

Insecticide and No. Lbs. in 1 Gal.	Gals. Emuls. Conc.	Gals. Water	Pounds Poison Per Acre Using 3 nozzles	Acres cover with number of nozzles per row. 1 noz.	2 noz.	3 noz.
2 lbs. Aldrin	1	23	0.25 lb.	24	12	8
2 lbs. Aramite	1	11	0.5 lb.	12	6	4
2 lbs. DDT	1	11	0.5 lb.	12	6	4
1.5 lbs. Dieldrin	1	29	0.15 lb.	30	15	10
1.2 lbs. Gamma BHC	1	8	0.4 lb.	9	4.5	3
1.6 lbs. Endrin (269)*	1	23	0.2 lb.	24	12	8
4 lbs. EPN*	1	39	0.3 lb.	40	20	13.3
2 lbs Heptachlor	1	23	0.25 lb.	24	12	8
2 lbs. Methal Parathion*	1	23	0.25 lb.	24	12	8
2 lbs. Parathion	3½ qts.	50	0.10 lb.	50	25	17
2 lbs. Systox*	1	23	0.25 lb.	24	12	8
4 lbs. TEPP	1¾ qts.	50	0.10 lb	50	25	17
6 lbs. Toxaphene	1	6.2	2.5 lb.	7.2	3.6	2.4
8 lbs. Toxaphene	1	8.6	2.5 lb.	9.6	4.8	3.2

*See Promising New Insecticides.

Dilutions are based on applying **1 gallon** of diluted material **per acre with each nozzle.** The size of the nozzle tips should be selected to correspond with different speeds of tractor.

For tractor speed of 2 to 3 miles per hour use No. 1 tip.
For tractor speed of 3 to 4 miles per hour use No. 1.5 tip.
For tractor speed of 4 to 6 miles per hour use No. 2 tip.
For tractor speed of 6 to 8 miles per hour use No. 3 tip.

PROTECT YOUR COTTON WITH "Black Leaf®" INSECTICIDES

Black Leaf
DUST FORMULATIONS

3-5-0 and 3-10-0
(BHC and DDT)
3-5-40 and 3-10-40
(BHC, DDT and Sulphur)
20-0
(Toxaphene)
20-40
(Toxaphene and Sulphur)
2½-0-0
(Aldrin)
2½-5-0 and 2½-10-0
(Aldrin and DDT)
2½-5-40 and 2½-10-40
(Aldrin, DDT and Sulphur)
1½-0-0
(Dieldrin)
1½-5-0 and 1½-10-0
(Dieldrin and DDT)
1½-5-40 and 1½-10-40
(Dieldrin, DDT and Sulphur)
5% DDT Dust
10% DDT Dust
NICOTINE Dust
Calcium Arsenate
Calcium Arsenate with Nicotine

•

Black Leaf
SPRAY CONCENTRATES

BHC Emulsions
BHC/DDT Emulsion
Toxaphene Emulsions
Toxaphene/DDT Emulsion
DDT Emulsion
ALDRIN Emulsion
DIELDRIN Emulsion

•

TEPP 40% or 20%

Your best protection against the weevil and other insects which attack cotton is a reliable, dependable insecticide. Make your choice from the complete line of Black Leaf® Cotton Insecticides listed at left.

Produced at Montgomery, Ala., and Waco, Texas, and stocked in warehouses conveniently located throughout the cotton belt, these Black Leaf Dusts and Sprays are the result of years of experience in the manufacture of high-quality insecticides.

Black Leaf Dust Formulations are manufactured to the *right* particle size. They do not float too long in the air nor drop too quickly to the ground. They settle and stick on the cotton plant, covering leaf and square with maximum protection.

Black Leaf Spray Concentrates mix easily with water for efficient, economical use. They contain stable materials which insure against breakdown and separation.

Black Leaf Cotton Insecticides are packed for easy handling ...Dust Formulations in multiwall bags...and Spray Concentrates in 5, 30 and 50-gallon drums. Use Black Leaf Cotton Insecticides and follow application schedules recommended by your local authorities.

TOBACCO BY-PRODUCTS & CHEMICAL CORPORATION
Richmond, Virginia • Sales Offices in 22 Cities

Grow Your Crop with V-C FERTILIZERS

per acre 4 to 5 days apart. A heavy infestation of large bollworms will require 15 to 20 pounds per acre.

For late season or migration of weevils use 12 to 15 pounds per acre.

SPRAY APPLICATION

Sprays are cheaper and more satisfactory for early season applications, especially when spraying and cultivating can be done at the same time. Sprays can be applied any time during the day. Try to avoid spraying while the dew is on the cotton plant.

Sprays can be applied with hand sprayers, ground machines or by airplane.

Always pre-mix the concentrate with equal parts of water before straining into the tank.

Strain all materials and water that go into the tank; this will help avoid nozzle stoppage.

Good Stable emulsifiable concentrates must be used. A good mixture will not cream at top or settle to the bottom nor oil separate from the water for at least 20 to 30 minutes after mixing. Check by mixing a small amount of concentrate with water.

Nozzle and Gallons Per Acre

For **thrips and cutworm control,** apply 1 gallon of dilution per acre with 1 nozzle per row—preferably 6 inches to 10 inches from top of cotton using 30 pounds pressure. In windy weather the tip may be as close as 4 inches to top of plant.

For **Early Season Control,** on cotton 12 to 20 inches high apply 2 gallons of mixture per acre, using 2 nozzles per row and 30 to 40 pounds pressure.

For **Mid-Season and Late-Season Control,** on cotton over 24 inches high apply 3 gallons of mixture per acre, using 3 nozzles per row and 40 pounds pressure. The center nozzle should be 6 to 10 inches from the top of cotton. Do not allow the nozzles to drag through cotton leaves or branches.

If heavy migration occurs, the dosage of all insecticides should be increased approximately 1/3. This can be done by using 1/3 less water in making dilution.

Recommended Sprays for Cotton Insect Control in MISSOURI—1953

Insect	Insecticide and Rate per Acre* (Use emulsifiable conc. only)	When to Apply and Remarks
Aphids "Plant-lice"	BHC at 1/3 lb. of gamma isomer per acre or lindane at 1/3 lb. or nicotine at 3-5 lbs.	When curled leaves or honey-dew or both appear. NOTE: To avoid bollworm trouble, do not use BHC alone in mid- or late-season. Add toxaphene or DDT for mid-season and late-season bollworm control.
Armyworms and Cutworms	Toxaphene at 2-3 lbs.	When one or two worms per linear foot of row are present or when migration into cotton begins.
Boll Weevil	Toxaphene at 2-3 lbs. or toxaphene plus DDT at 1-2 lbs. of toxaphene and ½ to 1 lb. of DDT or .25 lb. aldrin or .15 lb. dieldrin.	When 25 bolls per hundred plants show infestation. Repeat at 4-5 day intervals until control is obtained.
Bollworm	Toxaphene at 2-3 lbs. or toxaphene plus DDT at 2-3 lbs. of toxaphene and 1-2 lbs. DDT or DDT at 1-2 lbs.	When eggs and 4 or 5 worms are found for every 100 plant terminals examined.
Fleahoppers, Lygus Bugs, Stink Bugs, Rapid Plant Bugs, and Thrips	Toxaphene plus DDT at ½ lb. of toxaphene and ¼ lb. of DDT.	When 25-30 bugs per 100 terminals are present.
Grasshoppers	Toxaphene at 2-2½ lbs. or chlordane at 1-1½ lbs. or BHC at ⅛ to ½ lb. gamma isomer.	When 4 or 5 'hoppers per square yard are present. See County Agent for other grasshopper control recommendations.
Leafworm	Toxaphene at 2 to 3 lbs.	When leafworms appear early, time applications to hit newly hatched worms of second brood.
Red Spider Mites	Compound 88R at ½ to 1 lb.	When reddening and curling of leaves or webbing or mites appear.
Garden Webworms	Toxaphene at 2 to 3 lbs.	When worms and webbing appear.

*NOTE: The amounts per acre listed above refer to the technical material, thus toxaphene at 2 or 3 pounds means 2 to 3 pounds of the actual or technical toxaphene per acre. This amount varies with the different formulations of the various chemical companies.

1953 Cotton Insect Control Recommendations for:

Missouri

The 1952 cotton season in Missouri was not marred by any serious insect outbreak. However, some boll weevils migrated in, late in the season, and since the past winter has been mild, growers are urged to watch for weevil infestations in the coming season. The insect control recommendations for 1953 are essentially the same as those for 1952 except that dusts have been omitted because little or no dusting is done in this state. Furthermore, sprays have been proven to be eminently superior to dusts in this area.

It is emphasized that insecticides should not be applied under Missouri conditions if they can possibly be avoided without allowing the crop to be damaged seriously. More exact information is available in Missouri Agricultural Experiment Station Bulletin 545 or Extension Folder 11, obtainable free of charge from your County Agent or by writing to the Department of Entomology, University of Missouri, Columbia, Missouri.

1953 Cotton Insect Control Recommendations for:

New Mexico

A sound cotton program on your farm will lead to balanced production, lower cost, better cotton, and higher profits. Insect control is one of the important steps in such a program. Experiments have shown that chemicals are the only means practical and effective in reducing insect infestations on cotton, once they are present. The efficient use of poisons for insect control involves four important things—**(1) application of the right pesticide, (2) at the right time, (3) in the right way, and (4) in the right amount.**

The grower should remember that the responsibility for controlling insects rests squarely on his shoulders.

There are three important phases of cotton insect control:

1. Early season control.

2. Late season control, based on infestation.

3. Stalk destruction and farm cleanup.

Early Season Control

Early season control insures early fruiting and earlier maturity in those areas of the state where aphids, thrips, fleahoppers, and lygus bugs, alone or in combination, cause damage every year. The number of applications required depends upon the severity of infestation. Applications should be made at seven-day intervals if necessary, until control is obtained.

In some areas of the state, damage due to thrips, aphids, fleahoppers and lygus is rather severe. These areas may require treatment beginning when the cotton is in the four-leaf stage. However, it may often be necessary to treat earlier, to prevent loss of stand by darkling ground beetles, cutworms, armyworms, thrips, and aphids.

The early season control program should end, insofar as possible, 30 days before bollworms usually appear. This period is desirable to allow time for beneficial insects to build up sufficient numbers to give some protection against bollworms.

Late Season Control

Whether or not an early season control program was followed, a late season control program should be strictly followed when insect infestations require it. The number of applications needed for control varies according to the type and severity of infestations. Other points to be taken into consideration are the growing conditions of the plant and the available moisture.

Be sure insect populations in the field are high enough to demand insecticide application and do not make application because someone else in the vicinity is doing so. Each grower should be able to identify insects, make his own counts, and evaluate the damage in order to control insects properly. The effectiveness of an insect control program depends upon the proper use of recommended insecticides. **They must be properly applied at the right time.**

For late season control to be successful, treatment should begin when recommended and continue at five- to seven-day intervals until effective control is achieved. Dosages should be increased with the size of the plant and severity of infestation. (See table for specific control recommendations.)

Important: If an infestation of pink bollworms develops, please report it to your county agent immediately. Emergency control recommendations will be published if needed. During the past harvest season, enough pink bollworms were found to cause everyone interested in cotton production to be concerned. Control with insecticides is possible if an infestation is found at an early stage.

Stalk Destruction and Farm Cleanup

Destroy cotton stalks as soon as possible after the cotton is harvested. Stalks may be destroyed by cutting, or heavy grazing by livestock. This practice will eliminate an important overwintering place for many cotton pests. Ditch banks, fence rows, and other overwintering quarters should be kept free of weeds and other debris that harbors insects.

Clean cultural practices aid in reducing threatening infestations of pink bollworm. The Pink Bollworm Division of the Bureau of Entomology and Plant Quarantine recommends cultural practices, including stalk destruction on a community-wide basis, and the Extension Service urges support of the pink bollworm regulations.

Infestation Counts

• **Fleahoppers, lygus bugs, plant bugs, and stink bugs:**

1. Make weekly examinations when cotton begins to square.

2. Make 100 sweeps with a 15- or 16-inch net at five representative points in the field. Do not rely on a net of smaller diameter. Count number of insects collected at each point. Average per 100 sweeps indicates infestation.

• **Bollworms:**

1. Examine the **upper one-third portion** of 100 cotton plants. Special attention should be given to terminal growing points, leaves, and squares.

2. If bollworm eggs and/or four or five newly-hatched worms are found, infestation is high enough to start treatment. When first deposited on the plant, bollworm eggs are white and about one-half the size of the head of a straight pin. As hatching time nears, they change to a dirty-white color. As maturity nears, a brick-red band develops in the upper portion of the egg.

3. To obtain effective control, don't lose any time in applying insecticide after eggs and/or four or five worms are found. Apply insecticide at **five-day intervals** until effective control is accomplished.

4. When bollworms are 5/16 to 1/2 inch long, they begin to spend considerable time in the bolls and **cannot be economically controlled** with any **insecticide.**

5. In New Mexico, usually four gen-

(Continued on page 109)

NEW MEXICO Recommendations for 1953

Early Season Control Program

Insects	Begin Treatment	Dust Program (add 40% or more sulfur to all dust formulations)	Spray Program
Fleahopper, Lygus, and Thrips	Four-leaf stage or earlier if necessary.	5% DDT, or 20% toxaphene, 10 to 12 lbs. per acre. Treat at 7-day intervals.	2-1 mixture[1], or DDT or toxaphene ¾ to 1½ lbs. per acre.
Aphids (Cowpea aphid)	When needed.	2-3% gamma BHC, or 1-2% parathion, 10 to 12 lbs. per acre.	Parathion (25%) ½ to ¾ pint, or TEPP [2] (40%) ½ pint per acre.
Armyworms and Cutworms	When needed.	5% DDT, or 20% toxaphene, or 5% chlordane, 20 lbs. per acre.	2-1 mixture[1], or DDT or toxaphene 1 to 2 lbs. per acre.
		Late Season Control Program	
Bollworms	When eggs and/or 4 to 5 newly-hatched worms are found on upper ⅓ of 100 plants. Look on both upper and lower leaf surfaces, squares, and bracts for eggs.	10% DDT, or 20% toxaphene, 15 to 20 lbs. per acre. Treat at 5-day intervals if necessary until control is accomplished.	2-1 mixture[1], or toxaphene, 2 to 4 lbs. per acre. Treat at 5-day intervals if necessary until control is accomplished.
Leafworms	When worms first appear.	2-3% gamma BHC[3], or 1-2%[4] parathion, or 20% toxaphene, 15 to 20 lbs. per acre as needed.	Toxaphene, or 2-1 mixture[1] (for combination problems), 2 to 3 lbs. per acre as needed.
Pink Bollworm	If an infestation should develop, emergency control recommendations will be published.		
Fleahopper, Lygus, Plant Bugs	When 7-10 insects taken per 100 sweeps of 15- or 16-inch net.	5% DDT, or 20% toxaphene, 15 to 20 lbs. per acre. Treat at 7-day intervals if necessary.	2-1 mixture[1], or toxaphene, or DDT[5], ¾ to 1½ lbs. per acre at 7-day intervals.
Stink Bugs	When damaging infestation occurs[6].	2-3% gamma BHC, or 20% toxaphene.	Toxaphene, 3 to 4 lbs. per acre, or 2-1 mixture[1], 3 to 4 lbs. per acre.
Aphids	As needed.	2-3% gamma BHC, or 1-2% parathion, 15 to 20 lbs. per acre.	Parathion (25%) ½ to ¾ pint, or TEPP [2] (40%) ½ pint per acre, or Systox [7].
Red Spiders	When leaves begin to show silvering.	1-2% parathion, or Dusting sulfur[8], 25 to 30 lbs. per acre as needed.	Parathion (25%) ½ to ¾ pint, or TEPP [2] (40%) ½ pint per acre, or aramite[9], or Systox [7].

[1] A spray concentrate containing 2 parts toxaphene and 1 part DDT.
[2] TEPP (tetraethyl pyrophosphate) may be used in mixtures for aphid **"knockout."**
[3] If worms are less than half-grown, use 2%; if worms are more than half-grown, use 3%.
[4] If worms are less than half-grown, use 1%; if worms are more than half-grown, use 2%.
[5] If ½ gal. or more of DDT spray concentrate is used per acre, foliage may be burned.
[6] Usually, two or more insects per 100 sweeps. As stink bugs are difficult to pick up in net, visual inspection may be more accurate.
[7] Systox is a new phosphate material, field-tested only. If used, follow manufacturer's recommendations and precautions.
[8] Dusting sulfur has given little or no control on the two-spotted mite **Tetranychus bimaculatus** Harvey.
[9] Aircraft applications of aramite **sprays** have not been successful. Follow manufacturer's recommendations.

FOUR-SECTION rotary hoe used in cultivating young cotton in South Carolina.

Progress of

COTTON MECHANIZATION IN

South Carolina

Thirteenth in a Series

MECHANIZATION of the South Carolina cotton crop is making rapid progress. There are three main reasons for this progress. First, the scarcity and high cost of hand labor in growing cotton. In the past 10 years no other state has made more rapid progres industrially than has South Carolina. The new industries which have come into the state have claimed much of the labor formerly used in cotton growing, especially for chopping and picking. In former years it was relatively easy to pick up this labor during the chopping and picking seasons when an abundance of labor was needed. This situation does not exist today, and when labor can be had the price is almost prohibitive.

Second, to be profitable a cotton crop must be grown as cheaply as possible. Realizing this, farmers have demanded and the machinery manufacturers have produced, equipment suitable to all the jobs connected with cotton production both on the large level fields in the coastal area, and the small terraced fields of the Piedmont area.

The agricultural engineers of the South Carolina Experiment Stations and the Extension Service have cooperated with the manufacturers of farm machinery and equipment to produce the best type equipment for the varying conditions in South Carolina. This combination of ability and work has produced equipment for every specific task in cotton growing from preparing the soil to harvesting.

Third, the time factor in growing cotton is much more important. With the earlier-maturing varieties of cotton and with the insect and disease problem so urgent it is necessary to do things more quickly. When cotton was planted in April and matured in October or November and there were few or no insect problems, a week lost during the working season meant very little. But with cotton varieties that mature in four or five months, and with the present complex insect problem, a week's delay may mean the difference between a crop and a half crop. Consequently, speed is much more necessary today.

Some idea of the progress made in cotton mechanization during the 10 year

FOUR-ROW planter and fertilizer drill built and used on a South Carolina farm.

By S. A. Williams

South Carolina Extension Cotton Ginning Specialist

Cotton Mechanization Series Completed

The accompanying article on the progress of cotton mechanization in South Carolina completes a series of articles on 13 cotton growing states by recognized authorities, written especially for The Cotton Gin and Oil Mill Press. For the convenience of readers wishing to refer to earlier articles or to keep a complete file, the states covered and dates of the issues of The Press in which the articles appear are:

Alabama—Sept. 13.
Louisiana—Sept. 27.
Arizona—Oct. 11.
North Carolina—Oct. 11.
Oklahoma—Oct. 25.
Arkansas—Oct. 25.
Georgia—Nov. 8.
Texas—Nov. 22.
Missouri—Dec. 20.
Mississippi—Jan. 3
New Mexico—Jan. 17.
Tennessee—Feb. 14.

period, 1942-52, may be seen by comparing the number of power-drawn implements in use in each of those years. In 1942 there were about 6,000 tractors on the farms of South Carolina. By 1952 the number had increased to about 35,000. Power-drawn planting, cultivating, and insect-control equipment has increased during this period at about the same rate as tractors. In 1942 South Carolina had no mechanical harvesting equipment; in 1952 there were 108 spindle-type pickers in the state. The stripper-type harvester has not been very successful in South Carolina; consequently, very few have been used.

Various types of tillers and harrows are used in preparing the soil. Depending on topography, one-, two-, and four-row planters are used. The one- and two-row planters are used exclusively on the rolling contoured fields of the Piedmont. Weeders and rotary hoes are used in cultivating the cotton while it is small. Several types of power choppers are used in thinning the cotton. The power-driven rotary-blade type appears to do the best work. One-, two-, and four-row cultivating equipment is used. Usually this work is done with sweeps of various sizes. Much of the insect-control work is done with dusters using two-, four-, six-, or eight-row equipment. When power sprayers are used they are of the two-, three- or four-row types. Both one- and two-row mechanical pickers (spindle type) are used.

There are several difficulties encountered in mechanical harvesting. South Carolina being in an area of high humidity, it is difficult to keep down weeds and grass from the "lay-by" period until the cotton is ready to harvest. The spindle-type picker mixes some of the grass with the picked cotton and it is very hard to separate even with the best cleaning and ginning equipment. This area is subject to tropical storms during much of the harvesting period and when a severe storm hits much cotton is blown out of the burs. It is of course impossible to reclaim any of the cotton on the ground with a mechanical harvester. With new chemicals for the control of weeds and grass, the first of these problems may be solved. The problem of wind-blown cotton may be encountered any year the storms hit.

Generally speaking the gins of South Carolina are as good and well equipped as in any of the Southeastern States. The percentage of rough preparation in this state dropped from 15 percent in 1942 to less than one percent in 1952.

(Editor's Note: This article completes the series on the progress of cotton mechanization in the principal producing states.)

State Guides

(Continued from page 107)

erations of bollworms can be expected on cotton.

Application

Dusts and sprays are equally effective when properly applied. Dust applications should be made when the air is calm or nearly so. **The presence of dew is not necessary.** When ground machines are used, the dust nozzles should be placed at 4 to 6 inches over the tops of the plants, so as to deposit a residue on terminals, where the majority of eggs and small insects are found. **Spray** applications should not be made when winds exceed 15 or 20 miles per hour. Spray when plants are dry, so that the material will stay on the leaves. Poison runs off when leaves are wet. For early season treatment with ground equipment, one or two nozzles per row, placed 6 to 9 inches over the tops of plants, are sufficient. As plants increase in size, the number of nozzles should be increased until three are in use. Sprays should be applied at approximately 60 pounds pressure. A volume of 2 to 8 gallons of spray mixture is used in most low-volume spray machines. (Follow the manufacturer's recommendations.) Effectiveness of control depends upon the amount of toxicant used per acre, rather than on the number of gallons of spray applied per acre. As a safety measure, mount the spray booms on rear of tractor.

Both ground machines and airplanes are effective for applying poison. For best results with planes, flag the swaths so that they will overlap.

General

Don't plant corn in cotton fields. Corn serves as a primary host plant for the bollworm (corn earworm) and may lead to early infestations in cotton.

If possible, alfalfa and small grains should not be planted next to cotton. These crops support large infestations of insects which migrate to cotton as the crops mature or are disturbed by cutting.

Important: Whenever sulfur is available, include 40 percent or more dusting sulfur in all dust mixtures to suppress red spider build-up.

Care must be exercised to avoid contamination by drift when applying insecticides near pastures, hay crops, and vegetables that are to be eaten by humans or animals.

Observe all due precautions to avoid poisoning bees and other beneficial insects through careless and haphazard use of insecticides.

CAUTION: All insecticides are poisons, and precautions given on the labels should be strictly followed. Special precautions should be taken in handling TEPP, Systox, and Parathion to avoid prolonged contact with the skin or breathing the vapors or drift from either spray or dust.

1953 Cotton Insect Control Recommendations for:

North Carolina

It is impossible to predict what the insects have in store for us during 1953. We certainly cannot assume that boll weevils will not be present. Past history teaches us to watch out should we have anything like normal weather and moisture. This pest, which is the Number One insect threat each year to our crops can build up in one season from a mild infestation to a damaging one or it can be reduced in one season by low temperatures and unfavorable weather during

the summer periods. Fast build up came in 1941 following 1940 and in 1949 after 1948. The year 1950, we all remember, was our worst in history and the build up came after a second warm winter. We do not know all the factors involved nor can we predict what the weather is going to be during 1953. Hence, we must fall back on experience and it tells us to expect trouble rather than assume there will be no insect problems. Being prepared by having equipment and some insecticides available is the safest policy to follow.

Let us further examine our present situation. We have had above or normal rainfall throughout our state since early fall. While the drought last year reduced weevil populations during mid-summer, late brood development was rather high. We have had a cool and long winter but one without temperatures low enough to knock the pest out. So, it looks now very much like a year when the pests could have a more favorable season than during 1952. Much will depend on the number of weevils present in our fields in early June and the kind of season at that time. We do not have another threat of 1950 facing us but it could be worse than 1952.

This leads to point number two which is an important factor in our state.. We have a wide variation in weevil population in every county and a wide variation in individual fields in most areas. This seems to be a normal situation. We seem to have a uniformly heavy and general infestation only during periods of warm winters such as we had in 1948-1949 and 1949-1950. It is true, we can easily see that 1953 may be a worse season than 1952 or 1951 because both of these years were dry and hot and each had rather low winter temperatures. Data and experience support these statements.

Question number three might well be, what are we to do about it. As we see it we feel that growers should not use insecticides unless the pests are present. Growers can check their fields in late May and in early June for presence of adult weevils, thrips, aphids and other pests. County Agents in our state will be checking too at this time. We in the state office will be checking on developments and will get the reports out to the press and the radio, but let me say again, the grower must know what the situation is in his own field and in his own area. One may blindly apply materials if he prefers but there are many areas in the state where materials may not be needed until the mid and late season periods or not at all. Many growers did not need to apply materials last year. When they followed other good cotton production practices such as use of good seed, proper fertilization and spacing they obtained yields of a bale to a bale and a half per acre even though they did not need to apply insecticides. So, we would urge you to study your situation and check your fields in late May and at squaring time. If adult weevils are present at the rate of one or more per 100 plants or if the square infestation is near or above 10 percent, start applications at once. Two applications should be made at weekly intervals and if the infestations remain well above 10 percent continue applications at 5 to 7 day intervals, until the infestation drops. We will have timely suggestions on the situation during the season as the entire program will depend on seasonal development. Bollworms and mites may be real pests but again we cannot predict the situation at this time. Checking of fields in several places twice each week and having equipment and some insecticides on hand is the safest policy to follow. We must have high yields and obtain them in the most economical manner if we hope to stay in cotton production in North Carolina.

What materials to use is another important question. We have added diel-

NORTH CAROLINA Cotton Insect Control Recommendations—1953

Important Cotton Pests	INSECTICIDES		Application
	Dusts (3)	Sprays (4) Technical Material/Acre	
Boll Weevils and Bollworms	20% Toxaphene	2 lbs. Toxaphene	Where weevils are a problem each year, make 3 applications at 7-day intervals beginning at time of squaring. As season advances, make square counts and if infestation rises to 10% (1), make additional applications at 5-day intervals until crop matures (8).
	3% BHC-5% DDT	⅓ lb. BHC plus ½ lb. DDT	
	2½% Aldrin-5% DDT	¼ lb. Aldrin plus ½ lb. DDT	
	2½% Dieldrin-5% DDT	¼ lb. Dieldrin plus ½ lb. DDT	During "light weevil years" or in areas (2) where weevil damage is usually light, the infestation rate may be moved up to about 25%. When the control program involves frequent applications during mid and late seasons, bollworm build-up is usually avoided.
	2½% Heptachlor-5% DDT	¼ lbs. Heptachlor plus ½ lb. DDT	
Boll Weevils	Any of the above dusts or sprays may be used without DDT in early season applications when bollworms are not present. Endrin as a 2½% dust or as a spray at the rate of ¼ lb. active ingredient per acre has given good control under experimental conditions.		Apply according to infestation as discussed above. Bollworms may develop, especially during late season.
Bollworms	10% DDT	1½ lbs. DDT	Check for worms frequently during late season when most corn silks turn brown. When 4 to 5 small worms are found per 100 terminals make 2 to 4 applications at 5-day intervals.
	20% Toxaphene	2 to 3 lbs. Toxaphene	
Thrips	Any of the dusts or sprays with or without DDT recommended for boll weevil control.		Silvering and/or distortion of leaves indicates the presence of thrips. In areas where thrips are a consistent problem (certain Piedmont areas) make 2 to 4 applications at 7-day intervals beginning at the 2 or 4-leaf stage. Thrips may move to cotton from grain or winter cover crops.
Red Spiders (6)	1% Parathion (7)	1/5 lb. Parathion (7)	Make 2 or 3 applications at 5 to 7-day intervals when leaves first begin turning yellow or reddish brown. Coverage of under surfaces of leaves is important. Generally only one application of Systox required.
	3% Aramite	¾ lb. Aramite	
	Sulphur	¼ lb. Systox (7)	
		40% TEPP (½ pt./acre) (7)	
Aphids	3% BHC-5% DDT	Above formulations of Parathion or TEPP or Systox (7) or ⅓ lb. BHC	Treat when aphids cause extensive "leaf-curling" especially on young plants. Repeat treatment if needed.
	1% Parathion (7)		

1. WEEVIL INFESTATION COUNTS: The percentage infestation is based on the number of squares punctured by weevils out of each 100 squares. For fields of five acres or less, 100 squares is considered an adequate sample. The sample size should be increased proportionally for larger acreages. Select squares at random from the top, middle and bottom parts of the plants at representative points throughout the field. The squares may be selected while criss-crossing the field diagonally. Areas adjacent to woods and other hibernating quarters should be especially included in the area sampled.

2. AREAS WITH CONSISTENTLY LIGHT WEEVIL POPULATIONS: Cotton acreages on or near the northern boundary of our Cotton Belt fall in this grouping. (For example: Davie and the northern portions of Rowan and Iredell Counties).

3. AMOUNTS OF DUSTS PER ACRE: Early in the season, when plants are small, 6 to 8 lbs. dust per acre is adequate. As plants increase in size, dosages should likewise increase. Average mature cotton may be adequately treated with 15 lbs. dust per acre, while extremely rank cotton will require heavier applications. Applications of dust should be increased above those given above by at least ¼th when formulations are applied for bollworms or when surfur is applied for spider mites.

4. AMOUNTS OF SPRAY MATERIALS PER ACRE: The amounts of technical material per acre to apply in spray form will also vary according to the size of the plants as discussed for dusts. For example, about 1 lb. of technical toxaphene per acre gives adequate coverage when plants are small; whereas, as much as 3 lbs. of technical toxaphene per acre may be required for good coverage of rank cotton late in the season.

5. LOW-GALLONAGE AND HIGH-GALLONAGE SPRAYERS: Most spray equipment for cotton is the low-gallonage type which requires emulsion concentrates. Wettable powders may be used in high-gallonage equipment (ex: Boyette tobacco sprayers) but will result in clogging and poor application if used in low-gallonage sprayers. With proper nozzles, emulsion concentrates may be used in high-gallonage equipment. Follow manufacturers recommendations in mixing spray materials and adjusting rates of application.

6. RED SPIDERS: Damage from these pests is usually in localized areas and greatest during hot dry weather. Several species of mites infest cotton in North Carolina, each of which may present a different problem in control. While sulfur will control certain mites it will not control all species. We must have more information on the relative abundance and distribution of the various cotton mites, before specific recommendations can be given. There is some evidence that the effectiveness of Aramite is reduced if it is applied following applications of sulfur.

7. CAUTION IN HANDLING INSECTICIDES: All insecticides should be handled only in the manner prescribed by the manufacturer. Extreme caution should be exercised in handling Parathion, Systox, Aldrin, Heptachlor, TEPP, and Dieldrin. Do not use BHC when cotton is to be followed by peanuts, tobacco or Irish potatoes. When applying BHC or toxaphene, avoid drift to tobacco and keep in mind that indiscriminate drift of all insecticides should be avoided. For general information see "Precautions on Use of Insecticides" in Extension Circular #312, "Cotton Insect Control in North Carolina."

8. DURATION OF CONTROL PROGRAM: During weevil migration, applications should be continued until all bolls expected to produce cotton are hardened. Such a program is designed to protect tender bolls during this critical period.

drin and heptachlor and a new product, endrin, to our list this year for use in weevil control. We see no reason why growers should change from toxaphene, BHC-DDT, or aldrin-DDT, but the new materials have proven very satisfactory. Growers may let the price govern the material to use since all are good insecticides when used properly. We can say also that none will be of much value if the interval between applications is ignored or if little attention is paid to adjustment of nozzles, effect of wind during applications and other factors. Sprays are equally as effective as dusts but again growers must watch dosages per acre and care of equipment as a spray machine demands constant attention during operation. We should avoid use of BHC if potatoes, peanuts or tobacco are to follow cotton in the rotation.

I would like to urge growers also to watch drift and any careless handling of insecticides as all are poisonous and can injure the operator or plant and animal life. Arrange for proper and safe storage of the materials on the farm. One should urge his operators to get into the habit of washing hands, face or other exposed parts during and after working with the materials. Spray and dust operators will need respirators if they work continuously in insect control work. Read and study labels. They are put on the packages for the protection of the user.

Our state recommendations are available and our county agents will be glad to work with growers. We hope to follow developments again in several counties by checking treated and untreated fields. Make plans now and work for high yields. Let us work together to make 1953 a banner year.

1953 Cotton Insect Control Recommendations for:

Oklahoma

All organic insecticides often cause a red spider mite infestation to develop unless the dust contains at least 40 percent sulfur.

The following dusting materials or combinations of dusting materials have given good cotton insect control in Oklahoma during recent years:

BENZENE HEXACHLORIDE (3% gamma isomer), 5% DDT and 40% SULFUR MIXTURE

• **For Boll Weevil Control** — Apply at the rate of 10 pounds per acre when the square infestation is 10 percent or above, or as indicated under paragraph "How and When to Dust Cotton."

Apply at 5-day intervals when air is calm until weevils are under control.

If washed off in 24 hours repeat application.

• **For Bollworm Control**—Apply at the rate of 20 pounds per acre when the bollworms make their first appearance, and if possible before they have entered the cotton bolls.

• **For Cotton Aphid, Cotton Fleahopper, Plant Bug and Leafworm Control**—When the fields are treated with the above mixture for either boll weevil or bollworm control the above insects will also be controlled.

Do not mix this 3-5-40 combination with calcium arsenate, lime or other alkaline materials because the chemical reaction may cause them to be less effective. However, there is a lime-free calcium arsenate that can be mixed with either of the above insecticides. **Dust when the air is calm.**

CAUTION: Benzene hexachloride formulations should not be used where potatoes, peanuts or other root crops will follow cotton the next year for often an objectionable taste is given these crops.

DDT

• **For Bollworm Control Only**—Use a 10 percent dust and apply at the rate of 10 to 15 pounds per acre. Apply when worms are small and before they enter the bolls. **Dust when the air is calm.**

Two or more applications may be required for control.

DDT may cause heavy aphid infestation.

Do not mix DDT with common calcium arsenate, or other alkaline materials.

TOXAPHENE

• **For Boll Weevil Control**—Use a 20 percent dust plus 40 percent sulfur or a 20 percent dust without sulfur and apply at the rate of 10 to 15 pounds per acre. Apply at 5-day intervals when the square infestation is 10 percent or above. If washed off in 24 hours repeat application. **Dust when the air is calm.**

• **For Bollworm Control**—Use a 20 per-

cent dust plus 40 percent sulfur or a 20 percent dust without sulfur and apply at the rate of 20 pounds per acre.

Apply when the worms first make their appearance and before they enter the bolls.

• **For Leafworm, Cotton Fleahopper, Aphids, and Plant Bug Control**—Use a 20 percent dust plus 40 percent sulfur and apply at the rate of 10 pounds per acre.

One application is usually sufficient.

LIME FREE CALCIUM ARSENATE PLUS 1% PARATHION PLUS 5% DDT

• **For Boll Weevil, Bollworm, Leafworm, Aphid, and Mite Control**—Use 10 pounds per acre at 5-day intervals until insects are controlled. See insecticide chart on when to begin dusting.

Dust any time of day or night when the air is calm.

OTHER DUST COMBINATIONS

1.2 percent Aldrin plus 5 percent DDT.

1.5 percent Dieldrin plus 5 percent DDT.

10 percent Chlordane plus 5 percent DDT.

These dust formulations gave good control in 1951 — but have not been proven effective under conditions existing in 1950.

See chart for timing and amount to use.

CAUTION: Aldrin, Chlordane and Dieldrin should always be used with DDT to prevent a bollworm build up.

EXTREME CARE SHOULD BE USED IN HANDLING ALL OF THESE MATERIALS.

HOW AND WHEN TO DUST

Dust insecticides may be applied at any time of the day or night when the air is calm. Dust can be applied with any type of ground equipment such as hand dusters, cultivator attached dusters, cart dusters on which the power is generated by a small motor, and by power take-off dusters. There is a type of duster to meet the needs of the individual farmer. Most of the ground dusting during the past few years has been done by power take-off dusters which dust from 4 to 8 rows at a time.

If dust is applied by an airplane, the plane must be flown just above the cotton plants and the swaths should not be wider than the wingspread of the plane, which is usually 30 to 40 feet. The farmer should always furnish a spotter for the plane so that the pilot will know just where to make each flight through the field.

Do not permit pilots to dump large quantities of dust on a few rows in the field and make wide swaths, for the control will be very disappointing.

HOW AND WHEN TO SPRAY COTTON

Three years of testing by the Oklahoma Experiment Station have shown that boll weevils, bollworms, leafworms, and thrips can be successfully controlled by spraying as well as by dusting. In these tests, emulsifiable concentrates were used in low gallonage and low pressure sprayers.

The following spray formulations have given good control under Oklahoma conditions: Toxaphene-DDT Spray; Toxaphene Spray; B.H.C.-DDT Spray; Aldrin-DDT Spray; Dieldrin-DDT Spray; Chlordane-DDT Spray; Heptachlor; DDT Spray.

See spray chart for timing of sprays and amounts of actual chemical to be applied per acre. For effective control, it is necessary to apply the correct amount of actual chemical per acre at the right time.

The amount of diluted spray applied per acre will vary with the kind of sprayer used, the type nozzles used per row, the pressure in the nozzle, and the number of nozzles used per row. The pressure and speed of the tractor also govern the amount used per acre.

One nozzle per row is sufficient in small cotton before it starts to set squares. Use two nozzles per row on medium sized cotton up to 18 inches tall. Use three nozzles per row in tall, rank cotton. When using one nozzle, set it 6 or 8 inches above the tops of the plants so that the spray will completely envelop the plants. When using two nozzles per row set them so as to direct two cones of spray towards the sides of the plants. When using three nozzles per row on larger plants, have the third nozzle set so as to direct a cone of spray downward to cover the tops of the plants. Widen the angle of the two lateral nozzles so as to obtain as much plant coverage as possible.

Nozzles such as used for spraying orchards are not recommended because they use too much spray.

Some difficulties may be experienced

in spraying rank cotton where it laps across the rows and the foliage and limbs come into contact with the spray nozzles. See spray chart for timing sprays, and amount to use per acre.

CAUTION: 2-4-D is very toxic to the cotton plant and no ground sprayer or airplane that has been used in applying 2-4-D should be used in the cotton field.

HOW TO DETERMINE WHEN TO BEGIN TREATMENT

• **For Pre-Square Treatment**—Examine all plants on 100 linear feet of row.

The row should be selected near the center of the field and plants examined at three points in the row.

These points should be near each end of the field and in the middle.

When one or more weevils are found in this space, pre-square applications should be applied.

• **For Square Protection**—To determine the number of punctured squares, walk diagonally across the center of the field, picking 100 squares as you walk. These squares should be half grown or larger and an equal number should be picked from the top, middle and lower branches of the plants. After picking 100 squares, examine them for weevil injury. Record both egg punctures and feeding punctures as damaged squares. The number of squares damaged will give you the percentage of infestation when 100 squares are examined at each point. When 10 squares out of each 100 are punctured, treatment should begin and continue at 5-day intervals until infestation is reduced below 10 percent.

On Upland cotton in central eastern Oklahoma it is recommended that cotton receive two early applications of an approved insecticide to kill the over-wintering weevils. This practice is also effective on any early planted cotton where boll weevils are found at the rate of more than one weevil per 100 feet of linear row. When possible 30 days should elapse between the time of the last early application of the insecticide and the time the bollworms normally make their appearance. The reason for this is that the organic insecticides kill many of their natural enemies. By allowing a period of 30 days between the last early treatment and the time that the bollworm usually appears, the natural enemies of the bollworm will build up and help in controlling them. Early applications are also effective in controlling thrips and webworms that might be present in addition to over-wintering boll weevils.

Where the rate of application varies, for instance, from one pound to one and one-half pounds, the lesser amounts are for small cotton and when insects are not very numerous. The larger amounts are for larger cotton and when insects are numerous.

THE PINK BOLLWORM SITUATION

More pink bollworms were found in Oklahoma by the operators of the gin trash machines in the fall of 1952 than

OKLAHOMA Cotton Insect Control Recommendations, 1953

Insect and Pounds Per Acre

Insecticides	Boll Weevil	Bollworms	Webworm	Leafworm	Fleahopper	Aphid	Spider Mites
Dusts	For early applications, make first application before squares are large enough to be punctured Second application 7 days after first & third 7 days later if needed. For mid-season and later, when 10% of squares are punctured repeat every 5 days until controlled.	When eggs and 4-5 small worms per 100 plants at five day intervals for 3 applications.	When worms first appear.	When worms first appear.	When 15-35 fleahoppers are found per 100 terminals.	When honey dew begins to appear.	When leaves begin to turn brown.
3-5-40 3% g BHC 5% DDT 40% Sulfur	10-15 lbs.	20 lbs.	10-15 lbs.	10-15 lbs.	7-10 lbs.	10-15 lbs.	
3-5-0 3% g BHC 5% DDT No Sulfur	10-15 lbs.	20 lbs.	10-15 lbs.	10-15 lbs.	7-10 lbs.	10-15 lbs.	
3-10-40 3% g BHC 10% DDT 40% Sulfur	10-15 lbs.	10 lbs.	10 lbs.	10-15 lbs.	7 lbs.	10 lbs.	
3-10-0 3% g BHC 10% DDT No Sulfur	10-15 lbs.	10 lbs.	10 lbs.	10-15 lbs.	7 lbs.	10 lbs.	
20-40 Dust 20% Toxaphene 40% Sulfur	10-15 lbs.	20 lbs.	10 lbs.	10 lbs.	7 lbs.		
20-0 Dust 20% Toxaphene No Sulfur	10-15 lbs.	20 lbs.	10 lbs.	10 lbs.	7 lbs.		
Lime free Calcium Arsenate + 1% Parathion + 5% DDT	10 lbs.	10 lbs.		10 lbs.		10 lbs.	10 lbs.
2½% Aldrin + 5% DDT Dust	10-15 lbs.*	20 lbs.					
1½% Dieldrin + 5% DDT Dust	10-15 lbs.*	15-20 lbs.					
10% Chlordane + 5% DDT Dust		10 lbs.					
10% DDT Dust		10-15 lbs.					

Sprays	Actual Chemical	Actual Chemical	Actual Chemical	Actual Chemical	Actual Chemical	Actual Chemical	Actual Chemical
Toxaphene DDT Spray	1-2# Toxaphene .5-1# DDT	2# Toxaphene 1# DDT	.75# Toxaphene .375# DDT	2# Toxaphene 1# DDT	5# Toxaphene .25# DDT		
Toxaphene Spray	2 to 3#		1#	1-2#	.75#		
BHC-DDT Spray	.24-.36# g BHC .4-.6# DDT		.24-.36# g BHC .4-.6# DDT	.24-.36# g BHC .4-.6# DDT	.24-.36# g BHC .4-.6# DDT	.24-.36# g BHC .4-.6# DDT	
Aldrin-DDT Spray	.25-.5# Aldrin* .5-1# DDT	.5# Aldrin 1# DDT					
Dieldrin-DDT Spray	.25-.5# Dieldrin* .5-1# DDT	.4-.5# Dieldrin .8-1# DDT					
Chlordane-DDT Spray	.8-1# Chlordane* .4-.5# DDT	1# Chlordane .5# DDT					
Heptachlor	.5-1#						
DDT Spray		1-1.5#					

*Not proven effective under conditions existing in 1950.

For thrips control, use any of the above materials (with the exception of calcium arsenate) at half the rate recommended for boll weevil control.

ever before. This is the first time that live worms were found in large numbers. This pest was found in six additional counties which brings the total counties now infested up to twenty. The counties in which the largest number was found were Comanche and Cotton. The counties in which the pink bollworm has now been found are: Stephens, Jefferson, Cotton, Caddo, Kiowa, Tillman, Jackson, Harmon, Greer, Beckham, Washita, Comanche, McClain, Grady, Custer, Canadian, Cleveland, Love, Garvin and Hughes.

So far, no pink bollworms have been detected in any of the fields of growing cotton, and it is hoped that they never will become numerous enough to require the use of insecticides for their control. Farmers are urged to cooperate in carrying out the quarantine regulations. No cotton seed should be shipped out of the quarantine areas into pink bollworm-free areas.

1953 Cotton Insect Control Recommendations for:

South Carolina

Insect and Disease Control

1. A recommended pesticide should be used.

2. Proper timing, a sufficient number of applications, and thorough coverage are essential for effective insect control.

3. Rotation, good cultural practices, defoliaton, and early stalk destruction are important aids for control of both insects and diseases.

4. Seed treatment and resistant varieties are important factors in disease control.

I. COTTON PEST CONTROLS FOR 1953

What To Use

The recommended insecticides and miticides for use in South Carolina during 1953, together with the pests they control, are listed below:

Aldrin — Boll weevil, thrips, cotton fleahopper.

BHC—Boll weevil, thrips, cotton fleahopper, cotton aphid.

DDT—Thrips, cotton fleahopper, bollworm.

Dieldrin — Boll weevil, thrips, cotton fleahopper.

Endrin—Boll weevil, bollworm, thrips, cotton fleahopper.

Heptachlor—Boll weevil, thrips, cotton fleahopper.

Sulfur—Cotton fleahopper, spider mite.

Toxaphene—Boll weevil, thrips, cotton fleahopper, small bollworm; will suppress cotton aphids but will not control heavy infestations.

Other Insecticides — 1-1-1 Mixture — Boll weevil and early infestations of bollworms. See Emergency Control.

When To Use

• **Pre-Square Period**—If thrips or boll weevils are damaging seedling cotton make two applications at weekly intervals, beginning: For thrips control, when first true leaves appear; for boll weevil control, when buds of plants are severely attacked. This will prove profitable by allowing plants to grow more rapidly and thereby produce an earlier crop.

• **Pre-Bloom Period or Early-Season Control** — In areas where boll weevils cause damage every year, three weekly applications, beginning as soon as the first square is seen, will destroy many of the overwintering weevils, protect the early set of squares and delay the normal weevil build-up.

• **Blooming Period or Mid-Season Control**—When first blooms are seen, make three applications at weekly intervals. This series of applications should protect cotton until migration begins. All insecticides used during this period, except toxaphene and endrin should include one-half pound of technical DDT per acre per application for bollworm control. Bollworms are usually kept under control by regular applications of any of the recommended materials; however, outbreaks or build-ups of this insect may occur at any time during the cotton-growing season. Normally outbreaks prior to the beginning of the blooming period are not serious, but those occurring after that time, if not controlled, can greatly reduce yields.

• **Maturing Period or Late-Season Control**—When 10 percent of the squares are punctured or migration begins, whichever occurs first, make three or more applications at 4-day intervals to protect all bolls less than 3 weeks old. All insecticides used during this period, with the exception of toxaphene and endrin, should include 1 pound of technical DDT per acre per application for bollworm control. One-half pound of technical DDT per acre per application added to toxaphene during this period will give added protection against bollworm injury.

How to Make Infestation Counts

The life history of the boll weevil and the fruiting habits of the cotton plant indicate that continuity of poisoning application is essential. Any particular schedule of applications will not be suitable to all situations. Local insect infestations, stage of development of the cotton plant, and weather conditions are vital factors in fixing these schedules of applications on any farm. Therefore, it is up to the individual farmer to gain a fuller knowledge of his own insect problems. One way to do this is by making weekly field observations to determine what insects are present, and, in the case of boll weevils, what the infestation percentage is.

• **Boll Weevil Square Infestation Counts**—A simple and accurate method of making boll weevil infestation counts is to walk diagonally across a field, picking 100 squares at random from the top, middle, and lower branches of cotton plants. Count both egg-laying and feeding punctures as punctured squares. The number of punctured squares found gives the percentage of infestation by boll weevils in that field. Make one such count for each 10 acres of cotton.

• **Bollworm Infestation Counts** — Bollworm outbreaks can be detected by weekly examinations of a representative number (usually 100) of terminal buds for eggs and small worms (newly hatched larvae). The majority of the eggs and small worms can be found on the stems, leaves and squares of the top 3 or 4 inches of the tender terminal growth. The eggs are creamy-white in color and are about one-third the size of the head of an ordinary straight pin. Blackish and discolored feeding frass or droppings indicate that the worms are present. Look for these signs in the rank or fast-growing cotton first. If 10 to 15 eggs and 3 or 4 small worms are found to each 100 terminal buds examined, emergency measures should be taken.

Build-Ups and Outbreaks Requiring Emergency Measures

• **Thrips**—The first evidence of thrips injury on seedling cotton is a "silvering" on the underside of the leaves. Later stages of this injury can be recognized by the puckering of the leaves. This is sometimes referred to as "possum-eared" cotton.

• **Cutworms**—Cutworm outbreaks usually occur during the pre-square and pre-bloom period and may cause serious damage even during the blooming period. Control is usually secured by use of insecticides, either dusts or sprays at rates recommended under blooming period.

• **Aphids**—The first evidence of cotton aphid or "lice" injury is a deforming or stunting of the plant leaves. This insect secretes a substance known as "honeydew" which may be seen on the leaves and later on the lint.

• **Red Spiders and Spider Mites**—These pests are usually associated with hot, dry weather conditions. If allowed to go unchecked they can completely defoliate the cotton plant. The presence of fine webs and small reddish or yellowish spiders on the underside of the leaves indicates their presence. The first noticeable injury to the leaves is a mottling on the upper side. This is often incorrectly called "rust."

Pesticides for Emergency Controls

• **Aramite**—For controlling outbreaks of **red spiders** or **spider mites,** use either 10 pounds of 3 percent Aramite dust or 2 pints of an Aramite concentrate containing 2 pounds of technical Aramite per gallon. Use this amount per acre per application. Usually two weekly applications will be sufficient.

• **BHC** — For controlling build-ups of **aphids**, use 15 pounds of 3 percent BHC dust per acre per application, or its equivalent in a BHC spray. Make weekly applications.

• **DDT** — For controlling build-ups or outbreaks of **bollworms**, use 15 pounds

Quotes From Our Authors:

"GREATER PROGRESS has been made in the economical control of cotton insect pests during the last five years than during any similar period in previous years . . . due largely to the extensive development of new chemicals for insect control and improved methods of application in the development of low volume, low pressure sprayers."—H. G. JOHNSTON.

per acre per application of any recommended dust containing 10 percent DDT or 15 pounds of 10 percent DDT alone, or add 1.0 to 1.5 pounds of technical DDT per acre per application to the liquid insecticide being used. Make applications at 5-day intervals.

• **Parathion** — For controlling either **aphids, red spiders** or **spider mites,** use 10 pounds of 1 percent parathion dust per acre per application. Make weekly applications. **Bollworms** may build up following the use of parathion. The use of this chemical is not recommended where the rotary-type hand duster is to be used. Where the wettable powders are to be used, .5 pound 15 percent wettable parathion is the proper amount for 50 gallons of water.

• **Methyl Parathion**—Methyl parathion is similar to parathion except that it exerts some measure of boll weevil control. Methyl parathion sprays and dusts used for **aphid** and **spider mite** control should contain .25 pound of the technical methyl parathion per acre per application. For **boll weevil** control, dosages up to .5 pound of the technical methyl parathion per acre per application have been more effective than those of lesser concentrations. This insecticide shows promise for commercial use and is recommended for large-scale field trials in 1953.

• **EPN**—Another material whose properties are similar to parathion is EPN. It is effective against some **spider mites** and **thrips** when used at the rate of .25 pound of the technical EPN per acre per application and is somewhat effective against the **boll weevil** when .5 pound of the technical EPN is applied per acre per application.

• **Systox**—Systox is similar in toxic properties to parathion and other organic phosphate insecticides. It is a systemic insecticide; that is, it is absorbed by the plant. A single application has been known to control **red spiders** for as long as 6 weeks. This material should be used so that from .25 to .5 pound of the technical Systox is applied per acre per application.

• **TEPP**—For controlling either **aphids, red spiders or spider mites,** use .5 pint of 40 percent TEPP per acre per application. Make weekly applications. This chemical is recommended only when the special chemical mask designed for its use is worn by the operator.

• **Sulfur**—For controlling **red spiders** or **spider mites,** use 20 pounds of dusting sulfur per acre per application. Make weekly applications.

Dusts and Dusting Equipment

When dusting, always use a respirator. See special precautions for the use of masks when applying parathion. Avoid unnecessary skin contact with any insecticide. Become familiar with first-aid measures relative to the chemical being used.

Do not put dust into hopper until ready to start application. All dusts have a tendency to settle toward the bottom of the hopper and become packed. When this happens, uneven distribution of dust will occur when the duster is started.

Always keep lid on duster closed tightly when not in use. This will aid in keeping out moisture, which can cause a stoppage or faulty distribution during next operation.

A heavy dew is not essential for satisfactory dusting conditions, but the atmosphere must be calm. Dusting conditions are usually best during the hours from 5 p.m. to 9 a.m. Do not dust if wind is over 3 miles per hour. Do not depend on drift of dust from one row to another to control insects. If rain occurs within 24 hours after dusting, repeat application within 48 hours.

A rotary hand duster will care for 5 acres of cotton. A 2-row animal-drawn, traction duster will be adequate for 20 to 30 acres. Larger acreages can best be cared for by high-clearance, mule-drawn, traction dusters or tractor-mounted dusters covering 4 to 6 rows at a time, or by airplanes. Airplane dusters should not attempt to cover a swath greater than their wing span. When airplanes are used, flagmen should be used to mark areas already dusted.

Emulsifiable Concentrates and Spraying Equipment

Insecticides sold in liquid form are called emulsifiable concentrates. They generally are prepared by dissolving one or more chemicals or "toxicants" in suitable solvents. To this are added other chemicals called "emulsifiers" which cause the mixture to mix easily with water. When water is added to spray concentrates, most of them will form a white to cream-colored emulsion. After an emulsion has been applied by spray-

ing, the water and certain parts of the emulsion evaporate or dry. This drying process "breaks" the emulsion and deposits on the foliage the toxic chemical and other parts of the mixture. The deposit of insecticide from a spray is very adhesive and is not easily removed by rain.

Sprays should be applied only when the plants are dry. Do not spray cotton that is wet with either dew or rain. Sprays can be effectively applied in winds up to 10 miles per hour. It is recommended that sprays be applied only with mechanical equipment that will prevent spray drift from coming in contact with the operator.

Spraying equipment in which 2,4-D has been used must not be used to apply insecticides to cotton.

The simplest method of determining the number of gallons of spray applied per acre is to fill the spray tank up to the filling spout. Start pump and set regulator at specified pressure. Spray a measured acre at normal operating speed. Stop spray machine and measure the amount of water needed to refill tank to filling spout.

Another method of determining the number of gallons of spray applied per acre is to attach a quart fruit jar to one of the nozzles. This can be done by cutting a small hole in jar top, inserting shank of nozzle and screwing nozzle tip on underside of jar top. Now screw jar top onto jar. Be sure to make a small air hole in jar top so spray will enter jar. Pour several gallons of water into spray tank. Start pump and set regulator at specified pressure. Spray at normal operating speed until jar is full. Stop sprayer and measure acreage covered. Multiply number of nozzles being used by the amount of spray (1 quart) caught in jar. This will give the total amount of spray being applied to the acreage covered.

To calculate dosage in filling spray tank, multiply number of acres covered by one tankful (as determined above) by the number of pints of insecticides recommended per acre. Mix this total amount of insecticide with an equal amount of clean water and pour into tank. Add water until tank is full. Change the amount of insecticide when it is found that more or fewer acres are being covered per tankful.

The water used for diluting the spray should be perfectly clean. This is necessary because small trash or mud in the water will produce unnecesary wear on the pump and continually cause clogging of the nozzles, resulting in inefficient spraying and loss of time. The best source is from a closed water system. Under no circumstances should muddy water be used. Where creek or pond water must be used, oversized filters are commercially available for clarifying such water.

The emulsion concentrate should not be diluted with water until spraying is started. Pour the required amount of spray concentrate into a suitable container and add an equal amount of water. This is called the "pre-dilution." Stir thoroughly until the mixture is creamy white. Pour this mixture into the spray tank and add the required amount of water necessary to cover the desired acreage. Start pump and agitate the finished spray for at least two minutes by pumping back through the overflow into tank. Do not add the spray concentrate directly to tank without pre-dilution.

The diluted or emulsified insecticide must remain stable; that is the oil must

not separate from the water. If this happens the concentrate should be discarded or exchanged for another brand which will "hold," for a "broken" emulsion is not only ineffective but will seriously damage cotton foliage. If spraying operations are interrupted while there is still spray material in the tank, this material should be thoroughly agitated before resuming operation. This can be done by recirculation with the pump for a few minutes before continuing operation.

CAUTION: Liquid insecticide concentrates spilled on skin or clothing are extremely dangerous. Immediately remove clothing and bathe thoroughly with plenty of soap and water.

Results obtained from the use of the small hand, pump-up garden sprayer in 1951 and 1952 indicated that it can be satisfactorily and economically used by the small cotton farmer on acreages up to about 10 acres. It can be arranged to handle from 1 to 3 nozzles per row by the addition of booms and nozzles included in the original kit. It can be carried on the back of the operator, slung over the horn of a saddle with the operator riding on the mule's back, or this sprayer can be rigged for use on riding or walking cultivators or on tractors. This sprayer has a capacity of 3 to 4 gallons, and demonstrations have shown that when it is carried on the operator's back the average grower can cover 1 acre per hour.

When buying the small hand sprayer, it is advisable to buy also a few spare parts for use as replacements in case of a breakdown during operation. Most needed parts are pump washers, cut-off valves, hose clamps, and the seal for top of tank.

A 2- to 6-row, low-gallonage sprayer, mounted on tractor or animal-drawn equipment has been found satisfactory for cotton spraying. On very hilly land it is advisable to use equipment covering only 2 to 4 rows.

The mule-drawn, traction sprayer, commonly used for spraying tobacco can be used for applying emulsifiable concentrates, provided it is equipped with low-gallonage nozzles. These nozzles are available within the state. If emulsifiable concentrates are used with this type sprayer, protective shields should be mounted on them to prevent the spray drift from coming in contact with the operator.

It has been found through experience that galvanized pipe is quite satisfactory for one season's use as a boom or drop. Regular rubber garden hose can also be used for one season's operation.

The use of rubber or neoprene hose for drops without metal reinforcements has been found to be not as satisfactory as metal tubing. (The drops carry the spray from the distribution boom to the nozzles).

Airplane sprayers should not attempt to cover a swath greater than their wing span. When airplanes are used, flagmen should be used to mark areas already sprayed.

Spray Pump — For tractor-mounted sprayers, the spray pump should be of the power take-off type, with an efficient delivery of 540 r.p.m. Pumps with a sleeve to slide over the standard power shaft provide an easy and quick means of attachment. By-pass and pressure regulator valves are essential to maintain the desired constant pressure.

For gasoline-powered pumps (auxiliary engine-driven pumps as used on

animal-drawn spray rigs) it has been found that a jack-shaft with a flexible coupling between the shaft and the pump will avoid excessive leaking at the pump-packing gland. These pumps should have the same capacity and other features as power take-off driven pumps.

Spray Nozzles—A nozzle of the hollow cone type is best suited for spraying cotton. The equipment should be operated at the manufacturer's specified pressure.

Spray Nozzle Operation — Maintain nozzle direction and adjustment to manufacturer's specified distance from foliage. In most cases this is from 8 to 10 inches from the plant. Check this distance after each round and see that nozzles are functioning properly at the manufacturer's specified pressure.

Nozzles per Row—The number of nozzles needed for good coverage will vary with the size of the cotton plant and the terrain being covered. The spraying of cotton on hilly, terraced rows should begin with 2 nozzles per row and be changed to 3 nozzles per row when the first blooms are seen. In areas where fields are flat and rows are straight, it should be possible to get good coverage with 1 nozzle per row until the first blooms are seen. At that time a change to 2 nozzles per row would be necessary, and for late-season control, the use of 3 nozzles per row will prove satisfactory.

Strainers—Strainers are an important part of low-gallonage spray equipment. The inlet or suction hose should be equipped with a strainer to prevent any foreign material from entering the pump. This should eliminatae a large percentage of stoppages at both pump and nozzles. The pump and nozzles should also be provided with strainers and filters. Regardless of the care exercised to prevent nozzle stoppages, some will occur.

It has been found that stoppages are reduced to a minimum when 100-mesh strainers are used on the suction hose and 200-mesh strainers used at pump and nozzles. Extra nozzles should be provided in order to make a quick change in the field without losing time to clean a plugged one.

Care of Sprayer—Care should be exercised in cleaning the entire machine. It is a good practice to run clear water through the system for several minutes at the end of each day's operation. Nozzle tips are made of soft material and are easily damaged. If hard objects are used for cleaning tips, the orifice will probably be altered in both size and shape. This will result in varying both the spray pattern and the rate of application. Nozzles may be cleaned by washing in water or fuel oil or by using compressed air. Never use an object harder than a horse hair for probing into the orifice of the nozzles.

Wettable Powders and Their Use

The wettable powders are mixtures that contain certain chemicals called "wetting agents." These insecticides are mixed with water and applied with high-gallonage spraying equipment. The use of wettable powders in low-gallonage equipment will cause clogging of the strainers and nozzles. Regular cotton dusts cannot be satisfactorily used in either high- or low-gallonage sprayers for the same reason.

The mule-drawn, traction sprayer, commonly used for spraying tobacco, is used in some sections of the state for spraying cotton. The wettable powders are usually used in this machine. It will deliver about 15 gallons of liquid per acre with 1 nozzle per row and about 50 gallons per acre with 3 nozzles per row. If this type of machine is used, it is suggested that a 50-mesh screen strainer be used.

Mixing Wettable Powders—To about 5 gallons of water in a 55-gallon drum, add the desired amount of wettable powder. Mix thoroughly. To this add remainder of water necessary to give recommended rate of spray per acre. Stir thoroughly. Transfer this mixture into spray tank. Refill spray tank as needed from this prepared mixture. Always stir thoroughly before transfer as the powder will tend to settle to the bottom of the tank.

1-1-1 Mixture

The **1-1-1 Mixture** is still used in some sections of the state and has proven effective in **boll weevil** control. This mixture is composed of 1 pound of calcium arsenate, 1 gallon of molasses, and 1 gallon of water. Calcium arsenate is a good boll weevil poison but it is not effective against other cotton pests such as thrips, cotton fleahoppers, aphids, and red spiders or spider mites. Because of this, it is not comparable with the all-round insect control made possible with the use of the newer organic insecticides.

When the 1-1-1 mixture is used for early-season boll weevil control, the use of an organic insecticide is recommended during the blooming and maturing periods.

Precautions

All of the cotton pesticides recommended herein are poisonous to man and animals, and because of this they should be used with appropriate precautions.

The organic phosphates — parathion, methyl parathion, EPN, Systox, and TEPP—are highly poisonous to human beings if inhaled, absorbed through the skin, or swallowed. Repeated inhalation or skin contact (even in small amounts) may progressively increase suscepibility to parathion, methyl parathion, EPN, Systox, and TEPP poisoning, without giving rise to symptoms. Extreme care must therefore be exercised at all times in handling these products. These materials are not recommended for use in South Carolina unless the special chemical mask designed for their use is worn

SOUTH CAROLINA Recommendations

HOW MUCH TO USE		RECOMMENDED DUSTS
Time of application	**Pounds per acre**	**Dust formulations**
Pre-Square Period	6-8	2½% Aldrin (2½-0-0)
and		3% BHC (3-0-0)
Pre-Bloom Period		2½% Heptachlor (2½-0-0)
(Early-Season Control)	8-10	20% Toxaphene (20-0-0)
Blooming Period		2½% Aldrin-5% DDT (2½-5-0)
(Mid-Season Control)	10-12	3% BHC-5% DDT (3-5-0)
		2½% Heptachlor-5% DDT (2½-5-0)
See footnote below.		20% Toxaphene (20-0-0)
		2½% Aldrin-10% DDT (2½-10-0)
Maturing Period		3% BHC-10% DDT (3-10-0)
(Late-Season Control)	12-15	2½% Heptachlor-10% DDT (2½-10-0)
		20% Toxaphene-5% DDT (20-5-0)*

If only one dust formulation is to be bought, it is recommended that the dust be selected from the Mid-season group. These are the standard dust mixtures for South Carolina.

RECOMMENDED SPRAYS (Pounds of toxicant per gallon)

Time of application	Aldrin		BHC		Dieldrin	Endrin	Heptachlor	Toxaphene		DDT*	
	2.0	0.8	1.2	1.6	1.5	1.5	2.0	6.0	8.0	2.0	3.0
	Pints to use per acre										
Pre-Square Period	½	1½	1	¾	½	½	½	1½	1		
Pre-Bloom Period (Early-Season Control)	¾	2	1¼	1	½	1	¾	2	1½		
Blooming Period (Mid-Season Control)	1	3	2	1½	¾	1½	1	3	2	2	1⅔
Maturing Period (Late-Season Control)	1½	4	2½	2	1	2	1½	3½*	2½*	4	3⅓

RECOMMENDED WETTABLE POWDERS (Percent toxicant)

Time of application	Aldrin	BHC		Dieldrin	Heptachlor	Toxaphene	DDT*	
	25%	10%	12%	25%	50%	40%	50%	75%
	Ounces to use per acre							
Pre-Square Period	8	24	20	5	4	40		
Pre-Bloom Period (Early-Season Control)	12	36	30	8	6	60		
Blooming Period (Mid-Season Control)	16	48	40	10	8	80	16	11
Maturing Period (Late-Season Control)	24	64	60	15	12	120*	32	22

*For bollworm control during mid-season, add one-half pound technical DDT, and during late-season, add 1 pound technical DDT per acre per application to each of the above materials, with the exception of toxaphene or endrin. If the dust or concentrate being used already contains this amount of DDT, additional DDT need not be added. One-half pound of technical DDT per acre per application applied with toxaphene during late-season gives added protection against bollworm injury.

by the operator. Do not apply these chemicals under conditions where the drift will be carried into dwellings.

Liquid insecticides spilled on skin or clothing are extremely dangerously. Immediately remove clothing and bathe thoroughly with plenty of soapy water.

Users and handlers of insecticides should be thoroughly familiar with the various hazards and should take proper precautions in formulating, packaging, labeling, and applying pesticides.

Persons engaged in poisoning operations should wear a respirator as a protection against inhaling these poisonous particles. Loading and mixing should always be done in the open. Avoid unnecessary skin contacts with these materials.

All empty or cardboard containers in which insecticide dusts have been packaged should be ripped opened and burned or otherwise destroyed as soon as possible. If metal or glass containers are to be saved, they should be thoroughly washed and cleaned immediately after emptying. Never use such containers for feeding or watering livestock.

The insecticide should always be identified by label and stored in a place where it is inaccessible to irresponsible persons and animals. Poisoning operations should be done under such conditions and in such a manner as to avoid excessive drift onto adjacent fields where animals are pastured or where food crops are grown.

As soon as possible after poisoning operations are concluded, the operator should remove clothes contaminated with the insecticide and should bathe.

Insecticides destroy beneficial as well as injurious insects. Care should be exercised to avoid poisoning honeybees through careless use of insecticides. Whenever possible, nearby beekeepers should be notified before applications of any insecticide.

Spillage of insecticides where they might drain into water used by men or livestock should be avoided. The dumping of any poisons even in small amounts near sources of water supplies should be avoided. Certain of these materials are highly toxic to various forms of aquatic life. It is especially necessary to use minimum amounts in cases where there would be an unavoidable drift to ponds or streams stocked with fish.

General Information

For complete seasonal cotton pest control follow either the dusting or spraying schedule which includes nine or more applications. Comparable results can be obtained by the use of either dusts or sprays.

The uniformity of applications of any insecticide is largely dependent upon a constant rate of travel. A convenient rate of speed should be selected and then maintained. In spraying, slight variations in pump pressure can determine the desired flow of spray.

Bug-catching machines are not recommended for cotton insect control.

The use of fenders on wheeled equipment during late-season operations will reduce the number of bruised or crushed bolls. Plans are available for home-constructed fenders.

Experience to date indicates little immediate toxic effect on plants from the use of the organic poisons recommended herein, but there is a definite possibility that over a period of time toxic quantities may accumulate. This matter is being continually investigated.

The preceding paragraph has refer-

ence to those chemicals that might, over a period of years, accumulate in the soil, and is not intended to infer that these chemicals might accumulate on the foliage in sufficient amounts to result in foliage injury.

Cotton Insecticides in Soils—When the recommended cotton insecticides are used at the specified rates per acre, the amounts used are not sufficient to be hazardous to South Carolina soils. A part of these insecticides used goes to the soil where it may gradually break down or be lost through erosion and leaching. Experiments demonstrate that BHC in the soil may impart an off-flavor to white potatoes grown in the same soil at a later date. To date, however, there is no evidence that peanuts will pick up an off-flavor in soils where cotton insecticides have been used. Therefore, to be safe in 1953, white potatoes should not be planted in cotton soils contaminated with BHC.

1953 Cotton Insect Control Recommendations for:

Tennessee

GENERAL SUGGESTIONS

Insecticides shortages are not as acute as in 1950; however, the local dealer cannot possibly secure or carry in stock enough poison to fill all needs when every farmer waits until damage starts and then all want poison at once. Enough material for 4 or 5 applications should be on hand in advance of need.

The time of day will affect the value of applications of organic poisons. Late afternoon and evenings are the most desirable times for dust applications. Usually organic poison dusts should not be applied between 8 a.m. and 4 to 5 p.m., as rising air currents and high temperatures will reduce their effectiveness. Dusts should not be applied during windy periods.

Sprays and dusts are equally effective when each has been applied properly. Sprays are cheaper and more satisfactory for early season applications, especially where spraying and cultivating can be done in one operation. Sprays can be applied over a wider range of conditions, with fairly strong winds or in the middle of the day. Sprays should be applied when the plants are dry. Spraying equipment is more complicated than dusting. Use fender guards on tractors for large cotton.

In airplane dusting or spraying, the planes should fly about 5 feet above the cotton and not attempt to cover swaths greater than the wingspan of the plane. Flagging is desirable for dusting and absolutely necessary for spraying. For spraying, one to two gallons per acre is suggested; for dusting, 10 to 15 pounds.

Choice of insecticides presents no problem since several are effective. Success or failure of controls depends on proper application and timing. Rainy weather is an important factor to consider when applying insecticides. Aldrin and B.H.C. are quick-acting poisons and as such need not be repeated unless washed off under 12 hours. Toxaphene, dieldrin, and heptachlor are slower-acting and must remain on plants 24 hours.

Quotes From Our Authors:

"COTTON DEFOLIATION will give the grower the maximum benefit from his insecticide program and as near as possible year-round insect control,"—E. W. DUNNAM, A. J. CHAPMAN and H. R. CARNS.

• **Safety Measures**—All insecticides recommended for cotton insect control are poisonous and toxic to man. Insecticides containers should not be opened in closed rooms. Operators should avoid breathing all such materials. Rubber gloves and protective clothing should be worn when handling concentrates and the hands washed frequently. A bath and a complete change of clothes should follow any work in which the clothing becomes contaminated. Effective antidotes should be available for immediate use at all times. Read and follow all precautions as listed on labels by the manufacturers of each insecticide.

TREATMENTS

1. Cutworms, Thrips, and Fleabeetles. Early poisoning for these pests will be generally needed throughout the state. The first application is recommended when the two seed leaves (cotyledons) unfold. Two effective applications at

weekly intervals are recommended. These treatments prevent ragging and destruction of stands. Early applications get the cotton off to a good start and allow the crop to mature much earlier. Hibernating weevils, if present, will be controlled simultaneously.

2. Hibernating Boll Weevils, Fleahoppers, and Plant Bugs. The next applications should begin when the first square is seen (plant has from 7 to 9 leaves).

Two or three applications should be made at weekly intervals. These treatments are applied with a minimum of effort and material and are applied at height of fruiting period. These early treatments are recommended on the idea of setting a crop early and holding gains of early treatments above.

3. Summer and Late Season Control for Boll Weevil. Further poisoning should be based on weekly square infestation counts. This is the best way in which to determine weevil infestations: Pick 100 squares as you walk diagonally across the field from two directions, picking equally from top, middle, and lower limbs. The number of punctured squares out of each 100 squares picked is the percent infestation. **Squares should be picked from the plants only and not from the ground, and at random. No effort should be made to get punctured or non-punctured squares only.** In very large fields two or three such counts should be made.

Applications for boll weevils should be made at four or five-day intervals, beginning when 10 to 15 percent of the squares are punctured and continuing, if necessary, until bolls set are mature. During weevil migration (around Aug. 15) it may be necessary to reduce the time between application to three or four days and increase the amounts of insecticides. Control should be started during migration when 15 to 25 percent of the squares are punctured. If season is wet, start at 15 percent. Protect all bolls that will open until they are at least three weeks old. Some of the most effective control gains can be made at this time.

Poisons for weevils must be applied regularly in sequential series to get results. Not less than three applications should be made in series. After one series of three applications, make further square counts to determine if further treatments are required.

4. **Miscellaneous Treatments:** Control materials and rates of application for red spider, yellow-striped armyworm, aphids, leafworm, and bollworm are given in accompanying tables.

RECOMMENDED DUST INSECTICIDES

1. 3% Gamma Benzene Hexachloride (GHBC) Plus 5% DDT. This mixture will control practically all cotton insects when used at 10 pounds per acre. If bollworms become numerous, the rate may be increased to 15 pounds per acre if the bollweevil is also a problem; otherwise, 10 to 15 pounds per acre of 10 percent DDT dust alone will control the bollworms. The 3-5 mixture is used most economically when alternated at four to five-day intervals with calcium arsenate at 7 to 10 pounds per acre.

2. Aldrin. A dust containing 2.5 percent aldrin at 10 pounds per acre will control the boll weevil, the cotton fleahopper, tarnished plant bug, rapid plant bug, and thrips. Thrips and fleahoppers may be controlled with as little as 5 to 8 pounds per acre. Generally, aphids do not build up following its use. Hatching

leafworms are killed by it but it does not control large leafworms. Bollworms may be controlled by a mixture of 2.5 percent aldrin and 5 percent DDT.

3. Toxaphene. A dust containing 20 percent toxaphene at 10 to 15 pounds per acre will control the boll weevil, fleahopper, thrips, grassworm, leafworm, cutworm, grasshoppers, and rapid and tarnished plant bugs. Toxaphene at 10 pounds per acre is fairly effective against moderate infestations of the bollworm; but in heavy infestations, increasing the dosage to 15 to 20 pounds per acre, or the addition of 5 percent DDT, is desirable. This heavy rate also will control the yellow-striped armyworm and garden webworm. Thrips and fleahoppers may be controlled with as little as 5 to 8 pounds of 20 percent toxaphene per acre. The cotton aphid usually will not develop injurious infestations if toxaphene is used throughout the season.

4. Dieldrin. A dust containing 1.5 percent dieldrin at 10 pounds per acre will control thrips, cutworms, the boll weevil, cotton fleahopper, tarnished plant bug and rapid plant bug. Thrips and fleahoppers may be controlled with as little as 5 to 8 pounds per acre. Aphids do not usually build up after its use. Bollworms, yellow-striped armyworms, and garden webworms may be controlled by a mixture of 1.5 percent dieldrin and 5 percent DDT at 15 pounds per acre.

5. Calcium arsenate. This material is an economical and effective dust for use against the boll weevil, leafworm, and somewhat for bollworm. It is used at the rate of 10 to 15 pounds per acre for boll-weevil and leafworm, and 12 to 16 pounds per acre for bollworms if infestations are not too heavy. Dust at 4 or 5 day intervals for boll weevil. The use of calcium arsenate often will cause aphids to increase; therefore, alternate applications of calcium arsenate must contain an aphicide.

6. Heptachlor. A dust containing 2.5 percent heptachlor at 10 to 15 pounds per acre will control the boll weevil, plant bugs, cutworms, and garden webworms.

RECOMMENDED LIQUID INSECTICIDES

Emulsifiable concentrates of toxaphene, aldrin, dieldrin, benzene hexachloride (GBHC), heptachlor, DDT, and combinations thereof, will be available in 1953 for use in sprayers. See control calendar for recommended rates of application. These materials must be diluted with water for use. The amount of spray solution required per acre will vary with the type, number of nozzles, speed of equipment, etc. Nozzles should be kept 6 to 8 inches from the plants to avoid leafburn. For safety, the spray boom on the ground equipment must be located behind the operator. Small hollow cone nozzles should be used with an angle of spray of not more than 80 degrees. Tractor speed may vary 3 to 5 miles per hour, depending on equipment.

Wettable dusts cannot be used in low-gallonage gear-pump sprayers, as nozzles will clog and pumps will wear out. Spray concentrate can be applied with water at rates of up to 10 gallons per nozzle per acre without diminution of killing power, as long as the required poundage of actual insecticide is applied. See spray rate table for dilution of emulsion concentrates. See also U-T Circ. Inf. 80, "Construction High-Clearance Cotton Sprayer."

Spray Rate Table—TENNESSEE

Insecticide	A Lbs. of Poison in each Gallon Concentrate	B Gals. Water to each Gallon Concentrate	C Lb. of Poison Applied per Acre by 1, 2, and 3 Nozzles			D Acres covered by 1, 2, and 3 Nozzles per Row		
			1	2	3	1	2	3
Aldrin	2.0	23	0.08	0.16	0.25	24	12	8
Dieldrin	1.5	29	0.05	0.10	0.15	30	15	10
DDT	2.0	11	0.17	0.34	0.51	12	6	4
DDT	3.0	17	0.17	0.34	0.51	18	9	6
Gamma BHC	1.2	8	0.13	0.26	0.39	9	4.5	3
Gamma BHC	1.6	11	0.13	0.26	0.39	12	6	4
Heptachlor	2.0	23	0.08	0.16	0.25	24	12	8
Toxaphene	6.0	6.2	0.83	1.66	2.5	7.2	3.6	2.4
Toxaphene	8.0	8.6	0.83	1.66	2.5	9.6	4.8	3.2
TEPP	4.0	119	0.33	0.66	0.1	120	60	40

This table applies when the application rate of diluted spray solution is one gallon per acre per nozzle.

Use one nozzle per row for cotton to 10 inches high, 2 nozzles for cotton 10 to 18 inches, 3 nozzles for cotton 18 inches and over.

Under column C in table, dilution rates for all applications (1, 2, or 3 nozzles) remain the same. Just by changing the number of nozzles per row (1, 2, and 3) as the crop develops, the recommended amounts of insecticide will be applied. If speed and pressure are varied, dilution rates must be adjusted accordingly. If nozzles applying two gallons per acre per nozzle are used, for example, the amount of water (column B) must be doubled.

The figures in column A above represent actual weight of technical insecticide in one gallon of concentrate. They are given on manufacturers' labels as the percentage of toxicant by weight in a gallon of concentrate, and are purchasable as such.

To determine output of sprayer: Fill spray tank with a known amount of water, and spray a measured area at normal operating speed using the pressure recommended for the spray rig: Note time required to cover the area. Then measure amount of water required to refill spray tank to original level, and convert to an acre basis.

TENNESSEE 1953 Recommendations

COTTON INSECT CONTROL CALENDAR

	Insects	Treatment and Interval	Dusts and Lbs. Per Acre	Sprays and Nozzles Per Row
Early Season Control	Cutworms	When worms appear, repeat as necessary.	10% DDT, 20% toxaphene, or 1.5% dieldrin-10 lbs.	Toxaphene, dieldrin or DDT. 1 Nozzle.
	Thrips, fleabeetles. (If aphids appear, see below).	When 2 seed leaves spread. 2 applications at 7-day intervals.	20% toxaphene, 2½% aldrin, 1.5% dieldrin, 5% DDT or 3% GBHC, 2½% heptachlor 5-8 lbs.	Toxaphene, dieldrin, aldrin, DDT, GBHC, heptachlor. 1 Nozzle.
	Hibernating boll weevil, fleahopper, tarnished and rapid plant bugs.	At first squaring if insects present. 2 or 3 applications at weekly intervals.	20% toxaphene, 3% GBHC, 2½% aldrin, 1½% dieldrin, 2½% heptachlor 10 lbs. per acre.	Aldrin, dieldrin, GBHC, or toxaphene, heptachlor, 1 or 2 nozzles, depending on cotton size.
Late Season Control	Boll Weevil	10-15% infestation, 3 applications, 4-5 day intervals.	Same as above, 10-15 lbs. or calcium arsenate 10 lbs.	Dieldrin, aldrin, GBHC, heptachlor or toxaphene; 3 nozzles.
	Bollworm (controlled efficiently only when small).	When weekly counts show 10-15 eggs or 4 or 5 small worms per 100 terminals.	20% toxaphene or 5% DDT with GBHC, aldrin, or dieldrin 15-20 lbs. per acre. 10% DDT, 10-15 lbs. Note: DDT alone may bring on aphids or red spider.	DDT 1 to 1.5 lbs. per acre. 3 nozzles. If poisoning for weevil, add .5 lb. DDT to weevil insecticide for bollworm.
	Leafworm	When worms appear, repeat as needed.	20% toxaphene, GBHC, calcium arsenate, 10-15 lbs.	Toxaphene, GBHC. 3 nozzles.
	Aphids*	At first honeydew, repeat as needed.	3% GBHC, 12-15 lbs. 3% nicotine 10-12 lbs.	GBHC or TEPP. 3 nozzles.
	Tarnished and rapid plant bugs, fleahoppers.	10 to 35 per 100 terminals.	Same as for boll weevil except calcium arsenate.	Same as for boll weevil.
	Red Spiders*	When leaves start to turn color, repeat as needed.	3% aramite, 10-15 lbs. per acre.	TEPP .08 to .25 lb. per acre. Aramite .5 lb. 3 nozzles.
	Yellow-striped armyworm and garden webworm.	When worms appear.	20% toxaphene and 1½% dieldrin + 5% DDT, 15 lbs. per acre.	Toxaphene 3 lbs. or .15 lb. dieldrin + .5 lb. DDT. 3 nozzles.

*Parathion is an extremely dangerous poison. However, in emergency situations its use may be justified where qualified personnel are in a position to assume full responsibility and enforce all proper precautions as prescribed by manufacturer. If malathon and metacide are available, they can be used for aphid control and are much less hazardous.

1953 Cotton Insect Control Recommendations for:

Texas

Insects are a major threat to economical cotton production, but they can be profitably controlled if growers will use the right poisons at the right time. **Poisons must cover the plants to kill insects.** When they put on new growth, or the poison is washed off, plants are no longer protected.

On fertile soils where damaging infestations of boll weevils and bollworms occur, big profits have been made by controlling these pests. This has been true **even when a large number of poison applications was necessary for maximum yields.** On upland soils where insect infestations do not last so long, fewer applications may be needed. But they must be made in time to prevent loss of plant vigor, squares or bolls due to insect damage.

The recommended control program for 1953 is divided into three important phases:

1. Early Season Control.
2. Late Season Control based on infestation.
3. Early Stalk Destruction and Farm Cleanup.

Each individual grower must carry out the complete program if he expects to obtain the greatest benefits. He should make full use of all control measures that will help him get the highest possible acre yields, at the most profit.

EARLY SEASON CONTROL

Early season control insures early fruiting and earlier maturity in all areas of the state where thrips, aphids, fleahoppers or boll weevils, alone or in combination, cause damage every year. **Generally, two to four applications made at approximately 7-day intervals give effective control.**

Thrips, aphids, fleahoppers and boll weevils cause more damage in some areas of the state than in others. In these areas of greater damage, three or four applications may be needed. The first usually should be made when the cotton is in the 4-leaf stage. The two seedling leaves are not true leaves and should not be counted. In some cases, however, it may be necessary to treat earlier to prevent loss of stand by thrips, aphids, cutworms or certain armyworms.

Overwintered boll weevils begin to lay eggs when the oldest squares are about 1/3 grown. On reasonably early planted cotton, the last early season application of poison should be made when plants reach this stage of development. Use the maximum dosage for insecticides recommended in the table for early season control. This will reduce the first generation of weevils.

Regardless of the number of applications in the early season program, **the last should be made at least 30 days before the bollworm usually appears,** unless fleahopper or boll weevil infestations are extremely heavy. This period allows time for beneficial insects to build up in sufficient numbers to give some protection against bollworms. Individual fields or farms may receive considerable benefits from early season control but **it is most effective when practiced on a community-wide or county-wide basis. The larger the area treated the greater the benefits.**

Under some conditions early season applications may afford adequate protection for the entire season. However, in case of severe infestation, additional applications may be needed. In any case, **the use of early season applications is a valuable supplement to complete seasonal control.**

Sprays have given more effective and more economical control in insects attacking young cotton than dusts. Because of the small size of the plants a greater concentration of insecticides is obtained from a spray. Frequently, effective spraying can be accomplished at times during the day when dusting is ineffective.

BENEFICIAL INSECTS

At times and under certain conditions beneficial insects control or assist in controlling such cotton pests as the bollworm, cotton aphid and spider mites. They are of little or no benefit in controlling other insects such as the boll weevil, cotton fleahopper, pink bollworm, Lygus bugs, stink bugs and thrips. Farmers should never rely entirely on beneficial insects to give adequate control but should examine their fields frequently to determine whether or not insecticides are needed.

LATE SEASON CONTROL

Late season control depends on the the severity of infestation. **Insecticides should be applied when needed no matter whether early season control was followed or not.** The number of applications needed for control varies according to the insect infestation and amount of injury. Moisture and growing condition of plants should be considered. In other

words, there is no point in applying insecticides if cotton is not growing or able to put on fruit, except for boll protection.

Responsibility for controlling insects rests squarely on the grower's shoulders. Under GENERAL will be found information on how to make insect counts. **Each grower should be able to identify insects, make his own counts and evaluate the damage in order to properly control insects.** The effectiveness of an insect control program depends upon the proper use of recommended poisons. **They must be properly applied at the right time.**

For late season control of boll weevil and bollworm to be successful, treatment should begin when recommended and continue at 5-day intervals until infestations are reduced below the damaging point. The dosage should be increased with the size of the plant and severity of the infestation. All effective combinations of insecticides, and not necessarily preferred insecticides, have been recommended. **SEE TABLE FOR SPECIFIC CONTROL RECOMMENDATIONS.**

PROMISING NEW INSECTICIDES

Endrin (compound 269), methyl parathion, Malathon, EPN and Systox have shown considerable promise for the control of several cotton pests in field experiments during 1952. Although additional research is needed, sufficient data have been obtained to warrant their use in large scale field trials during 1953. Suggested uses of these materials are as follows: Endrin sprays 1/10 to 1/5 lb. per acre for thrips and fleahoppers, ¼ to ½ pound for boll weevil, bollworm and leafworm; methyl parathion sprays and dusts 1/8 to ¼ lb. per acre for leafworm, aphids and spider mites, 1/3 to ¾ lb. with 2/3 to 1½ lbs. of DDT for boll weevil and bollworm. EPN sprays and dusts ⅛ to ¼ lb. per acre for leafworm and spider mites, 1/3 to ¾ lb. with 2/3 to 1½ lbs. of DDT for boll weevil, bollworm and pink bollworm; Malathon sprays ¼ to 1/3 lb. per acre for aphids and spider mites; Systox sprays ⅛ to ¼ lb. per acre for aphids and spider mites. **(See Precautions).**

EARLY STALK DESTRUCTION AND FARM CLEANUP

Destruction of cotton stalks immediately after harvest and as far as possible in advance of the first frost, will reduce the boll weevil and pink bollworm population. Early stalk destruction forces the boll weevil into a starvation period before time to enter winter quarters. **This prevents a late season build-up of weevils and pink bollworms and reduces the number that survive the winter.** To obtain best results, stalks should be **completely** destroyed to prevent new growth and eliminate volunteer plants.

Plans must be made in advance, and these plans put into action, to insure an early harvest. Early planting of fast-maturing varieties and early season insect control will enable many farmers to complete harvest before frost. Early harvest means better grades of lint and higher quality seed.

Pastures, roadsides, ditch banks, fence rows and other overwintering quarters should be kept free of weeds and debris that harbor insects. Clean up such places by mowing, discing or with a stalk cutter so as not to create an erosion problem.

Early destruction of stalks by individual growers is worthwhile, **but community-wide or county-wide destruction is still better.** In the southern part of the pink bollworm regulated area, an organization is already set up to get this important job done. In other counties where the crop can be harvested before frost,**an organized effort should be made to secure cooperation on a community-wide and county-wide basis.**

In the northwestern part of the state where this cannot be done, stalks should be left standing until after a hard freeze, for pink bollworm control; then

they should be plowed under as deep as possible.

PINK BOLLWORM

Cultural practices including regulated dates for planting and destruction of stalks are specified by the State Department of Agriculture. They are still the most effective and economical means of combating the pink bollworm. **See Pink Bollworm Control Information.**

DDT Application Schedule: (1) When at least 10 percent of blooms are infested or 200 worms per acre are present, begin control immediately. (2) When 5 to 10 percent of blooms are infested or 100 to 200 worms per acre are present, begin control when first bolls are 20 days old. (3) Otherwise, begin treatment when 10 to 15 percent of the bottom bolls become infested. Once treatments are underway they should be continued until most of the bolls are open.

GENERAL

Recommendations for late season control are based on infestation records. **The grower must learn to make accurate counts at the proper time if he is to use poison most profitably.**

• Fleahopper

1. Make weekly examinations. Begin when cotton is old enough to produce squares.

2. Examine the main-stem terminal "bud" (about 3 or 4 inches of the top of the cotton plant) of 100 cotton plants. Count both adults and nymphs. These examinations should be made at several representative points in the field.

• Boll Weevil

1. Make weekly examinations for boll weevil. Begin after the plants are squaring freely or have produced as many as 3 squares per plant, at least 1/3 grown. Pick 100 squares as you walk diagonally across the center of the field. Squares should be about 1/3 grown or larger. An equal number should be picked from the top, middle and lower branches of the plants. When 100 squares have been picked, examine them for weevil punctures to determine the percent infested.

2. At least 2 or 3 applications of poison at 5-day intervals are required. Poison will effectively control the adults; therefore, more than 1 application is needed to kill the adults as they develop from the punctured squares. Frequently, more than 3 applications are necessary when infestations are heavy and growing conditions are good.

3. When weevils are found in injurious numbers late in the season after the crop is set and squares are scarce, one or more applications of poison should be made to protect the bolls.

• Bollworm

1. When most of the corn silks begin to dry, or at the time bollworms usually appear, start examinations for bollworm eggs on cotton. Continue every 5 days until the crop has matured. In general, these dates will be as follows, but check with your County 7-Step Cotton Committee:

Coastal Bend Area—Third week in June.
South Texas—First week in July.
Central Texas—Second week in July.
North Texas—Third week in July.

2. Examine 100 plant terminals as indicated for fleahopper.

3. If bollworm eggs are found on the terminals and 4 or 5 young worms are found in small squares or on tender top

leaves, infestation is high enough to start treatment. When they are first deposited on the plants, bollworm eggs are white and about the size of mustard seed. As hatching time nears, they change to a dirty white color. These eggs usually will be found scattered on the terminal portions of the plants.

4. To obtain effective control, no time should be lost in applying poisons after eggs and 4 or 5 young worms are found. Apply poison at 5-day intervals as long as necessary.

Past experience has shown conclusively that the use of DDT alone for bollworm control greatly increases the possibility of injurious aphid infestations. Any grower who uses DDT alone should be prepared for a "knockout" control for aphids. An aphicide can be used alone or in combination with other insecticides.

* * * *

Experiments show that dusts and sprays are equally effective in most areas when properly applied. To be most effective, repeat applications must be made if the poison is washed off within 24 hours, except in the case of aphid control.

Dust applications should be made when the air is calm or nearly so. The presence of dew is not necessary. When ground machines are used, the dust nozzles should be placed 4 to 6 inches over the tops of plants.

Spray applications may be made at any time when winds do not exceed 15 to 20 miles per hour. Spray when plants are dry so the material will stay on the leaves. Poisons run off when leaves are wet. For early season treatment with ground equipment, 1 to 2 cone type nozzles per row placed 6 to 9 inches over the tops of plants, are sufficient. As plants increase in size, number of nozzles should be increased until a maximum of 3 is in use. Sprays should be applied at approximately 60 pounds pressure and at a volume of 2 to 8 gallons per acre. As a safety measure, it is recommended that spray booms be mounted on rear of the tractor.

Both ground machines and airplanes are effective for applying poison. For best results with airplanes, it is essential to flag the swaths so they will meet or overlap. Increase dosage recommended in Table at least 50 percent when an airplane is used for making early season applications.

Some cotton poisons are destructive to honey bees, and since bees are important for pollination of many agricultural crops, a determined effort should be made to prevent their destruction.

A supplemental guide is available for the Lower Rio Grande Valley Area.

CAUTION: All insecticides are poisons and precautions given on the labels should be strictly followed. Special precautions should be taken in handling TEPP, parathion, EPN, methyl parathion and Systox to avoid prolonged contact with the skin or breathing the vapors or drift from either spray or dust.

TEXAS 1953 Insect Control Recommendations

Early Season Control Program

Insects	Begin Treatment	Dust Program	Spray Program (Based on active ingredients per acre)
Cutworm certain Armyworms	When needed	10% DDT, or 20% toxaphene, 15 to 20 lbs. per acre as needed.	Toxaphene, or 2-1 mixture [1], 2 to 3 lbs.; or DDT, 1 to 2 lbs. per acre as needed.
Thrips and Fleahoppers only	4-leaf stage or earlier if necessary	10% toxaphene-40% sulfur, or 3-5-40 mixture [2], or 2½% aldrin-40% sulfur, or 2½% dieldrin-40% sulfur, or 2½% heptachlor-40% sulfur, or 5% DDT-75% sulfur, 7 to 10 lbs. per acre, 7-day intervals.	Toxaphene, ¾ lb.; aldrin or heptachlor, ⅛ lb.; dieldrin, 1/10 lb.; or DDT, ½ lb. per acre, 7-day intervals.
Boll Weevil [3], Thrips and Fleahoppers	4-leaf stage or earlier if necessary	20% toxaphene-40% sulfur, or 3-5-40 mixture [2], or 2½% aldrin-40% sulfur, or 2½% dieldrin-40% sulfur, or 2½% heptachlor-40% sulfur, 7 to 10 lbs. per acre, 7-day intervals.	Toxaphene, ¾ to 1½ lbs.; aldrin or heptachlor, ⅛ to ¼ lb.; dieldrin, 1/10 to 1/5 lb.; or BHC [4], 1/6 to 1/3 lb. per acre, 7-day intervals.
Aphid	When needed	3-5-40 mixture [2], or 1% parathion, 10 to 15 lbs. per acre for "knockout", applied when air is calm.	40% TEPP [5], ½ pint; BHC [4], 1/3 lb.; or parathion [5], 1/8 lb. per acre for "knockout".

Late Season Control Program

Boll Weevil	25 to 35% infestation	20% toxaphene-40% sulfur, or 3-5-40 mixture [2], or calcium arsenate, or lime-free calcium arsenate plus 1% parathion, or 2½% aldrin-5% DDT-40% sulfur, or 2½% dieldrin-5% DDT-40% sulfur, or 2½% heptachlor-5% DDT-40% sulfur, 10 to 15 lbs. per acre, 5-day intervals.	2-1 mixture or toxaphene, 2 to 3 lbs.; 3-5 mixture [6], .8 to 1.2 lbs.; dieldrin-DDT (1-2), ¾ to 1½ lbs.; aldrin-DDT (1-2), or heptachlor-DDT (1-2), ¾ to 2 lbs. per acre, 5-day intervals.
Bollworm	When eggs and 4 or 5 worms are found per 100 terminals	20% toxaphene-40% sulfur, or 3-5-40 mixture [2], or calcium arsenate, or lime-free calcium arsenate plus 1% parathion, or 2½% aldrin-5% DDT-40% sulfur, or 2½% dieldrin-5% DDT-40% sulfur, or 2½% heptachlor-5% DDT-40% sulfur, or 10% DDT-40% sulfur [7], 10 to 15 lbs., 5-day intervals; or 2-10-40 mixture [8], 15 lbs. per acre preferred for heavy infestations, 5-day intervals.	2-1 mixture [1], 3 lbs.; 3-5 mixture [6], 1.2 lbs. dieldrin-DDT (1-2), 1½ lbs.; aldrin-DDT (1-2), or heptachlor-DDT (1-2), 2 lbs.; or DDT [7], 1 to 1½ lbs. per acre, 5-day intervals.
Aphid	When honey-dew first appears	3-5-40 mixture [2], or 1% parathion, 10 to 15 lbs. per acre for "knockout".	40% TEPP [5], ½ pint; 3-5 mixture [6], 1.2 lbs.; or parathion [5] ⅛ to ¼ lb. per acre for "knockout".
Spider Mites [9]	When leaves begin to turn yellow or rusty brown	Sulfur, 20 to 25 lbs.; 1% parathion, or 3% aramite, 10 to 15 lbs. per acre as needed.	Aramite [10], ⅓ to ½ lb.; or parathion [5], ⅛ to ¼ lb. per acre as needed.
Fleahopper	15 to 35 per 100 terminals	5% DDT-75% sulfur, or 10% toxaphene-40% sulfur, 10 lbs. per acre, 7 to 10-day intervals.	Toxaphene, or 2-1 mixture [1], ¾ lb.; or DDT, ½ lb. per acre, 7 to 10-day intervals.
Lygus and other Plant Bugs	When damaging infestation appears	5% DDT-75% sulfur, or 10% toxaphene-40% sulfur, 10 lbs. per acre, 7 to 10-day intervals.	Toxaphene, or 2-1 mixture [1], ¾ lb.; or DDT, ½ lb. per acre, 7 to 10-day intervals.
Stink Bugs	When damaging infestation appears	20% toxaphene-40% sulfur, or 3-5-40 mixture [2], or 2-10-40 mixture [8], or 10% DDT [7], 10 to 15 lbs. per acre, 7-day intervals.	Toxaphene, or 2-1 mixture [1], 2 to 3 lbs.; or DDT [7], 1 to 1½ lbs. per acre, 7-day intervals.
Leafworm	When worms first appear	Same as recommended for boll weevil when needed, except omit aldrin-DDT, dieldrin-DDT and heptachlor-DDT.	Toxaphene, or 2-1 mixture [1], 1 to 2 lbs. per acre as needed.
Grasshoppers	When damaging infestation appears	20% toxaphene-40% sulfur, or 3-5-40 mixture [2], or 10% chlordane-40% sulfur, 15 to 20 lbs.; or 2½% aldrin-40% sulfur, or 2½% dieldrin-40% sulfur, or 5% heptachlor-40% sulfur, 8 to 15 lbs. per acre as needed.	Toxaphene, or chlordane, 1½ to 3 lbs.; dieldrin, or aldrin, ⅛ to ¼ lb.; or heptachlor, ¼ ½ lb. or BHC [4], .45 to .60 lb. per acre as needed.
Pink Bollworm	When needed (see Text)	2 to 3 lbs. DDT per acre at 7-day intervals; 1½ to 2 lbs. DDT per acre at 4 to 5-day intervals when combined with other insecticides for control of this and other insects. Sprays or dusts may be used.	

[1] A spray concentrate containing 2 parts toxaphene and 1 part DDT.
[2] 3% gamma benezene hexachloride-5% DDT-40% sulfur.
[3] The maximum dosage for weevil control.
[4] Gamma benzene hexachloride.
[5] Parathion and TEPP may be used in mixtures with other sprays for aphid or spider mite "knockout" (see caution).
[6] 3 parts gamma benzene hexachloride—5 parts DDT.
[7] Damaging infestations of aphids are likely to occur following applications of DDT.
[8] 2% gamma benzene hexachloride-10% DDT-40% sulfur.
[9] Parathion and increased dosages of aramite (¾ to 1 lb.) will be necessary to control the two-spotted mite in West Texas (2 applications at 7-day intervals are usually needed).
[10] Aramite may be used in mixtures with other sprays for spider mite "knockout".

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